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# Development and validation of the Dutch Social Attunement Questionnaire (SAQ)

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**Preregistration:** The study design and the analysis plans were not preregistered

## Abstract

The social plasticity hypothesis proposes that *social attunement*, that is, the adaptation to and harmonization with one's environment, plays a crucial role in the risk for developing alcohol use disorders (AUDs) during adolescence, whereas in adulthood it paradoxically may make individuals more sensitive to the social pull to reduce drinking. This study aimed to develop a valid measure of social attunement: the social attunement questionnaire (SAQ). A total of 26 items were developed and the questionnaire was completed by 576 Dutch mid to late adolescents and adults over three rounds of online data collection. Using exploratory factor analysis in part of the sample (N = 373), the final questionnaire was reduced to two subscales with a total of 11 items. This structure was confirmed using confirmatory factor analysis in the second part of the sample (N = 203). Results showed that the SAQ has acceptable internal consistency, good measurement invariance to gender, and subscales assessing both cognitive as well as behavioural components of social attunement. In line with expectations on alcohol use settings, SAQ scores were not associated directly with alcohol use, but they were predictive of alcohol use when taking into

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account the interaction between perceived peer drinking and age. The SAQ appears suitable for the assessment of social attunement in (young) adult men and women, particularly assessing the role of social attunement in alcohol use settings. Further research is needed to confirm the utility of the SAQ in older adults and a broader variety of social settings.

#### KEYWORDS

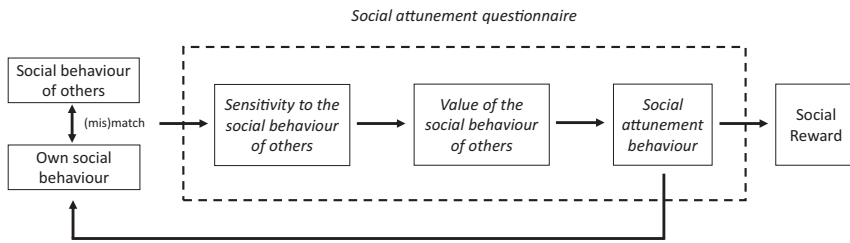
adolescent development, alcohol use, questionnaire development, social attunement, validation

## 1 | INTRODUCTION

Adolescent development is of great interest to multiple fields of research, including addiction research. It is characterised by major physical and social changes, and high social learning and brain plasticity make that adolescents are generally very flexible in adjusting to those changes (Cousijn et al., 2018). At the same time, adolescents often show increased risk-taking (Crone & Dahl, 2012). This attraction to risky behaviour is thought to be guided by a relative imbalance between the heightened sensitivity of fronto-limbic brain areas involved in affective learning and reward processing, and the more protracted development of frontal areas guiding control over our actions (Casey et al., 2008; Gladwin et al., 2011). As reward sensitivity is high and cognitive control suboptimal, the immediate reward is preferred, whereas the long-term consequences of (risky) actions largely are ignored. Although seen in a variety of situations requiring social decision-making, this imbalance appears to be particularly important in the often-seen excessive alcohol use in social situations during mid to late adolescence, which increases the risk of developing alcohol use disorders (AUDs; MacPherson et al., 2010). Nonetheless, most mid to late adolescents and young adults who drink excessively, and meet the criteria for an AUD, go through a phase of the natural reduction of use when maturing (Chassin et al., 2004; Vergés et al., 2013). This natural reduction, sometimes referred to as 'maturing out of addiction', might be caused partly by increased behavioural control, but this development does not explain fully why some adolescents maintain AUDs in adulthood and most naturally reduce use (Heyman, 2009).

Paradoxically, the same neuro-social mechanisms that place mid to late adolescents at initial risk for developing AUDs also might result in a unique resilience to the maintenance of alcohol-related problems (Cousijn et al., 2018; Orford, 2001). More specifically, the *social plasticity hypothesis* describes how changing interactions between (1) (social) learning and (brain) plasticity, (2) behavioural control, and (3) social attunement could explain this increase and subsequent decrease in alcohol use seen in the transition from adolescence to adulthood (Cousijn et al., 2018). Social attunement, one of the concepts central to this *social plasticity hypothesis*, can be defined as the degree to which one adapts and harmonises with one's social environment (Cousijn et al., 2018). During adolescence, parental influence diminishes, whereas the need to attune socially to one's peers seems to increase (Marshal & Chassin, 2000; Sebastian et al., 2008). Attuning to one's peers also can affect adolescent alcohol use through perceived alcohol use norms within the peer group (e.g. Brooks-Russell et al., 2014; Teunissen et al., 2012). Hence, adolescents prone to social attunement, who spend most of their time with an excessively drinking peer group, are hypothesised to show more excessive drinking behaviour, even in the absence of explicit peer pressure. Likewise, in a peer group with limited alcohol consumption, adolescents who are attuned highly to their environment are less likely to drink excessively.

The transition to adulthood involves major events like finishing studies, starting a job, finding a partner, and having children. During this maturation phase, group attitudes regarding alcohol use often change, resulting in social



**FIGURE 1** Overview of the conceptualisation of social attunement. The figure displays how individuals reflect on their own social behaviour in relation to the behaviour of others. Dependent on the mismatch between those behaviours, individuals might socially attune. The extent to which this happens depends on the individuals' sensitivity to the social behaviour of others and the extent to which one values the behaviour of the other. Over time, a continuous cycle of this social attunement process will result in increasingly socially rewarding outcomes.

devaluation of alcohol use (Jackson et al., 2001). It is hypothesised that individuals prone to social attunement, who were at risk for excessive drinking at first, will adapt to this change in alcohol's social value and reduce their alcohol use accordingly (Cousijn et al., 2018). Social attunement to the changing group norms might therefore be an important factor in the process of 'maturing out of addiction' (e.g., Dawson et al., 2006; Lee et al., 2015). Due to relatively high brain plasticity and learning flexibility compared to adults, adolescents and young adults are thought to be particularly good at attuning to those new group standards, even after periods of excessive use.

Although questionnaires on more negative reinforcing motives of behaviour change, such as social conformity (e.g., Mehrabian & Stefl, 1995), have been developed over the years, there is no measure to assess social attunement yet. The difference in reinforcement motives guiding the behaviour makes it crucial to distinguish social attunement from social conformity behaviour. Where social conformity could be described as behavioural adaptation to avoid negative feedback from the social environment (peer pressure/obedience), social attunement specifically explains behavioural adaptation to optimise and increase positive social feedback from this environment (positive reinforcement). Furthermore, this process might occur more implicitly and gradually than conformity: as a result, over time one's behaviour will start to resemble that of the individuals with whom one spends the most time, creating social harmony within the group. This behaviour potentially will be affected by the sensitivity of an individual towards the behaviour of others, and social attunement tendencies also depend on the differences between one's behaviour and the behaviour of the environment to which to attune. Depending on the extent to which one values the behaviour of others, one will attune more or less to the behaviour of these individuals within the social group. This results in social harmony and increasingly positive socially rewarding outcomes (See Figure 1).

To test the *social plasticity hypothesis* (Cousijn et al., 2018), a valid instrument to measure social attunement is key. For this purpose, we developed and validated the social attunement questionnaire (SAQ). Although the questionnaire was developed in the context of alcohol use and related problems because initiation and escalation of alcohol use is a clear example hypothesised to be affected by social attunement, we aimed to develop a questionnaire that also could be used in other contexts (e.g., other substance use and social risk taking behaviours). We then assessed convergent and divergent validity of the SAQ and assessed measurement invariance to gender. SAQ scores were expected to be associated positively, but not one-on-one, with social conformity (Mehrabian & Stefl, 1995), as similar responses to items that reflect behavioural *outcome* (change of behaviour and social reward) was expected, whereas social attunement and social conformity are supposed to diverge on items that reflect the *motives* and *circumstances* in which these behavioural outcomes occur. In addition, the social reward questionnaire (Foulkes et al., 2014) was included to assess how social attunement—with the goal of receiving a social reward—relates to the pro-social interaction (good reciprocal relationships), admiration (gaining positive attention), sociability (engaging with the social group), passivity (giving control to others) and negative social potency (being cruel) subscales of this measure. Social attunement was expected to be associated positively with the pro-social interaction, admiration and sociability subscale of the social reward

questionnaire as these reflect values that would facilitate social attunement. No association was expected between social attunement and more non-social behaviours such as the passivity and negative social potency subscales of the social reward questionnaire. Similarly, assessing divergent validity, we did expect social attunement to not be associated with the need for a cognition scale (Cacioppo & Petty, 1982) as this scale is a commonly used scale of reflection of non-social decision-making and interests.

Regarding the role of social attunement in alcohol consumption, we expected stronger social drinking motives (social and conformity) to relate to higher social attunement. Furthermore, we expected social attunement to decrease with age in our group of mid to late adolescents and adults (Cousijn et al., 2018). As such, we expected social attunement to predict higher alcohol use, especially in relatively younger participants and those who report relatively higher levels of peer alcohol use.

## 2 | METHOD

The development of the SAQ consisted of multiple phases including (1) item generation, (2) assessment of content and face validity, (3) online data collection for psychometric validation of the SAQ. In this third phase, we used exploratory factor analysis for item reduction and structure evaluation before assessing the internal consistency of the scale. Then, confirmatory factor analysis was performed to confirm the structure, internal consistency and measurement invariance. Furthermore, convergent and divergent validity was evaluated and the association between social attunement, perceived peer drinking, and alcohol consumption was assessed. Methods were approved by the ethics committee of the psychology department of the University of Amsterdam (round 1 and 3: 2018-DP-8768, round 2: 2018-DP-9891), and participants in each phase were fully informed about the procedure and gave (online) consent before participation.

### 2.1 | Item generation

The following questionnaires, assessing constructs related to social attunement, were reviewed for initial item generation: Social Monitoring Scale (Lennox & Wolfe, 1984; Snyder & Gangestad, 1986), Concern for Appropriateness Scale (Lennox & Wolfe, 1984), Need to Belong Scale (Leary et al., 2013) and the Peer Pressure, Popularity, and Conformity Scale (Santor et al., 2000). A total of 23 items that, after adjustments, could fit the conceptualisation of social attunement (Figure 1) were selected from the above-mentioned questionnaires (selected by EK, selection checked by GM). After adjustment of the items (EK), all items were reviewed again (GM & JC) to combine or delete items with overlapping content and the selection was supplemented with new items to make sure the included items covered all stages of our conceptualisation, resulting in a total of 24 items.

### 2.2 | Content and face validity

The first 24-item version of the SAQ was reviewed by six external experts in a relevant field (e.g., social learning or peer relations). These experts were provided with an explanation of our conceptualisation of social attunement and asked to give their assessment of the relevance of each of the items item to the concept ('This item is relevant for the construct') and the clarity of each item ('This item is formulated clearly') on 7-point Likert scales (1 = completely disagree, 7 = completely agree), and to provide general feedback on the items. The average content validity index (CVI) for relevance, that is, the percentage of positive (4 or higher) evaluations per item, was .88 (good; Polit & Beck, 2006). Two items with a CVI below .78 (sufficient; lowest CVI = .67; Polit & Beck, 2006) were adjusted based on the provided feedback (EK) and re-assessed (GM & JC). In addition to our group of experts, a group of eight non-experts (variable age, sex and educational level) were asked to answer the clarity question for all items. Clarity was assessed by

averaging the scores per item across both experts and non-experts. Eight items (33.3%) with an average score below 4 were adjusted based on provided feedback (EK) and re-assessed (GM & JC). After re-evaluation of all items, two additional items were developed (EK) and reviewed (GM & JC) with the aim of capturing the socially rewarding outcome (Figure 1) of social attunement.

## 2.3 | Psychometric evaluation of the SAQ

### 2.3.1 | Participants

A total of 589 responses on the SAQ were collected during three rounds of data collection (round 1:  $N = 196$ , round 2:  $N = 182$ , round 3:  $N = 211$ ). Participants were recruited through social media (rounds 1 & 3), the lab website of the University of Amsterdam (rounds 1 & 3) or during the first-year psychology student test sessions held at the University of Amsterdam (round 2) and were all fluent in Dutch and lived in the Netherlands while participating in the study. Participants were compensated by receiving research credits (students in rounds 1, 2 and 3) or the opportunity to participate in a raffle for online gift cards (both students and non-students in rounds 1 and 3). Inclusion in each round was based on age (round 1: 16–35, round 2: no limit, round 3: 16–80) to ensure the inclusion of participants from mid-adolescence to adulthood. Exclusion only applied to those who already participated in earlier rounds of the study. Sample characteristics are provided in Table 1.

### 2.3.2 | Measures

**Item reduction and structure assessment.** The 26-item SAQ (Table S1) was used to assess social attunement on a 7-point Likert scale (1 = completely disagree, 2 = disagree, 3 = more or less disagree, 4 = neutral, 5 = more or less agree, 6 = agree, 7 = Completely agree; see Table S1 for Dutch scale). Potential scores varied between 26 and 182 with higher scores indicating higher social attunement.

**Sample characteristics and measurement invariance.** Participants were asked to report on their age, gender (Round 1 and 3: male/female/other; Round 2: male/female), country of birth and highest completed level of education (low = primary education, pre-vocational secondary education or vocational education; middle = higher secondary education or higher professional education; high = pre-university secondary education or university) to be able to compare samples and assess measurement invariance.

**Convergent and divergent validity.** The need for cognition questionnaire (Round 1; Cacioppo & Petty, 1982; Verplanken et al., 1992), social reward questionnaire (Round 1; Foulkes et al., 2014; items from the sexual reward subscale were omitted), and social conformity questionnaire (Round 3; Mehrabian & Stefl, 1995) were included to assess convergent and divergent validity.

**Age, social attunement and alcohol consumption.** Participants completed the alcohol use disorder identification test (AUDIT; Saunders et al., 1993) to assess alcohol use and related problems, Cooper's Drinking motives questionnaire (DMQ; Cooper, 1994) to assess drinking motives (i.e., social, conformity, coping and enhancement), and a three-item adaptation of the first three items of the AUDIT to assess perceived peer drinking (PPD; See Table S2).

### 2.3.3 | Procedure

After providing consent, participants completed basic demographic questions, followed by the 26-item SAQ, additional questionnaires to assess convergent and divergent validity, as well as questionnaires to assess the association between social attunement, perceived peer drinking, and alcohol use. In round 2, participants were compensated

TABLE 1 Sample characteristics

Measure	Sample 1	Sample 2	Statistics	Effect size	p-value
N	373	203	-	-	-
Age, Med (range)	20.00 (16:35)	30.00 (16:78)	$U = 23960.00$	.37	<.001
Gender, (Male/Female/Other%)	55.23/44.24/0.54	29.56/70.44/0.00	$\chi^2(2, N = 576) = 36.73$	-	<.001
Education level, med	3.00	2.00	$\chi^2(2, N = 576) = 158.09$	-	<.001
Low (%)	3.75	33.99	-	-	-
Middle (%)	10.46	29.56	-	-	-
High (%)	85.79	36.45	-	-	-
SAQ Full, M (SD)	46.80 (8.42)	43.02 (8.27)	$t(574) = 5.19$	.46	<.001
SAQ - Cognitions - subscale 1, M (SD)	18.62 (4.98)	16.56 (4.78)	$t(574) = 4.81$	.42	<.001
SAQ - Behaviour - subscale 2, M (SD)	28.19 (5.17)	26.46 (5.53)	$t(574) = 3.74$	.33	<.001
Need for Cognition, M (SD) <sup>a</sup>	63.79 (9.28)	-	-	-	-
SR-Admiration, Med (range) <sup>a</sup>	21.00 (8:28)	-	-	-	-
SR-Negative Social Potency, Med (range) <sup>a</sup>	14.00 (7:35)	-	-	-	-
SR-Passivity, Med (range) <sup>a</sup>	8.00 (3:21)	-	-	-	-
SR-Pro-social interaction, Med (range) <sup>a</sup>	31.00 (21:35)	-	-	-	-
SR-Sociability, Med (range) <sup>a</sup>	14.00 (7:21)	-	-	-	-
Conformity, Med(range)	-	.00 (-31:22)	-	-	-
Perceived peer drinking, Med (range)	6.00 (0:11)	5.00 (1:12)	$U = 47800.00$	.29	<.001
AUDIT, Med (range)	9.00 (0:26)	6.00 (1:26)	$U = 39621.00$	.25	<.001
DM-Conformity, Med (range)	5.00 (5:25)	5.00 (5:15)	$U = 37222.50$	.24	<.001
DM-Social, Med (range)	17.00 (5:25)	13.00 (5:25)	$U = 41464.50$	.38	<.001
DM-Coping, Med (range)	7.00 (5:25)	6.00 (5:19)	$U = 33947.50$	.13	.02
DM-Enhancement, Med (range)	15.00 (5:25)	11.00 (5:21)	$U = 41751.50$	.39	<.001

Note. AUDIT: alcohol use disorder identification test; DM: drinking motives; Education: low = primary school—Dutch pre-vocational training secondary school (VMBO/MAVO)—vocational training (MBO), medium = Dutch pre-university of applied sciences secondary school (HAVO)—university of applied sciences (HBO), high = Dutch pre-university secondary school (VWO)—university (WO); M: mean (reported when data was normally distributed); Med: median (reported when data was not normally distributed); SAQ, social attainment questionnaire; SD, standard deviation; SR, social reward.

<sup>a</sup>Questionnaires only completed by part of the sample (N = 196).

with research credit after participation as our questionnaires were included in a larger test-session organised by the department of psychology of the University of Amsterdam. In rounds 1 and 3, all participants had the choice to leave their email address to participate in a raffle of six (three per round) 20-euro online gift cards. The raffle was performed after finishing data collection per round.

### 2.3.4 | Data analysis

**Item reduction and structure assessment.** The data from rounds 1 and 2 were combined into sample 1 ( $N = 378$ ) and the data from round 3 was used as sample 2 ( $N = 211$ ), to create two sufficiently large samples for the planned analyses. Sample 1 was used for exploratory factor analysis (EFA) and sample 2 for confirmatory factor analysis (CFA). Outliers, that is, participants with SAQ sum scores  $\pm 2.5$  SD from the mean were excluded from analyses. Using sample 1, EFA was performed for item reduction and to assess the factor structure of the SAQ. The EFA was performed in JASP (JASP Team, 2020) using parallel analysis, principal axis factoring (accounting for violation of multivariate normality) and Promax rotation (because of the expected correlation between factors). Item reduction was guided by factor loadings ( $>.35$  minimal accepted loading), uniqueness, Kaiser-Meyer-Olkin (KMO) criteria ( $>.70 = \text{good}$ ), improved model fit and increased explained variance after item reduction, and additional conceptual considerations (see Section 3). Then, using the final factor structure, internal consistency for the full scale, as well as each subscale separately, was assessed using Cronbach's alpha ( $>.70$  acceptable for scales with 10 or more items) and McDonald's Omega ( $>.70$  acceptable). Using sample 2, CFA was performed to confirm the factor structure in an independent sample that differed from the original sample. Model fit was assessed using a chi-square test (significance indicating poor fit), Tucker-Lewis index (TLI; good fit  $>.90$ ), Root Mean Square Error of Approximation (RMSEA; acceptable fit  $<.08$ , good fit  $<.05$ ) as well as the comparative fit index (CFI; good fit above  $>.90$ ;) when comparing fits. Again, internal consistency for the full scale as well as each factor was assessed using Cronbach's alpha and McDonald's Omega (Hayes & Coultts, 2020).

**Measurement invariance.** To assess measurement invariance to gender, we ran the CFA again for both genders separately to check structure fit. Then, group CFA was performed assessing configural invariance, metric invariance, scalar invariance and strict factorial invariance to gender. Gender differences in SAQ scores were assessed using an independent sample t-test (or Mann-Whitney U test in case of violation of assumptions).

**Convergent and divergent validity.** To assess convergent and divergent validity, we performed Pearson correlations (or Spearman correlations in case of violation of assumptions) between total SAQ as well as SAQ subscale scores, and the need for cognition questionnaire, social reward questionnaire, social conformity questionnaire and age.

**Age, social attainment and alcohol consumption.** Additional analyses were conducted to assess whether social attainment was associated with drinking motives, perceived peer drinking and alcohol use. First, Pearson correlations (or Spearman correlations in case of violation of assumptions) between total SAQ scores and the four subscales of the DMQ, as well as age, PPD, and AUDIT score were assessed. Second, regression analyses were performed to assess whether SAQ score was predictive of AUDIT score and whether PPD, age and their interactions explained additional variance in this association.

## 3 | RESULTS

### 3.1 | Sample characteristics

Sample 1 (including rounds 1 and 2) and sample 2 (including round 3) significantly differed on most demographics, with higher age, a higher percentage of females and lower median completed education in sample 2 (Table 1). Looking at alcohol-related measures, perceived peer drinking and AUDIT score were higher in sample 1, and the samples differed on all drinking motives (Table 1).



## 3.2 | Exploratory factor analysis

Exploratory factor analysis (EFA) was used for item reduction and the assessment of the structure of the SAQ. Before running the first EFA, items 2, 8 and 19 were deleted for conceptual reasons. These items targeted social attunement in alcohol drinking situations specifically, and while originally included because of our interest in social alcohol drinking situations, were deleted to increase the generalisability of the measure for use in other social situations. Assessment of KMO (Full scale = .79) and the significance of Bartlett's test of sphericity ( $\chi^2 = 1486.63$ ,  $df = 148$ ,  $p < .001$ ) indicated adequacy of the data for EFA.

### 3.2.1 | Item reduction

Initial EFA, using parallel analysis, indicated a 5-factor structure (Table S3 - step 1). Based on the initial EFA, items 7, 10, 15, 23 and 25 were deleted because of a lack of loading (all  $< .3$ ) on any of the factors and items 5 and 26 were deleted because of low KMO (KMO  $< .6$ ; Table S3). This resulted in a 2-factor structure (Table S3 - step 2) from which items 1, 11, 16, 18 and 24 were omitted because of a lack of loading on any of the factors (all  $< .3$ ). The final item set included 11 items divided over two factors (Table S3 - step 3; Tables 2 and 3).

### 3.2.2 | Final structure

Although the chi-square test of model fit was significant ( $\chi^2[34, N = 373] = 92.991$ ,  $p < .001$ ), additional fit indices indicated an acceptable to good fit (RMSEA = .069; TLI: .86). As expected, there was a substantial correlation between the subscales ( $r = .62$ ), but the items included in both subscales seemed conceptually distinct. Items of subscale 1 reflect social attunement related *Cognitions*, that is, the extent to which you *think* about your own behaviour and how others perceive your behaviour. Items of subscale 2, on the other hand, reflect actual social attunement related *Behaviour*, that is, the extent to which you adjust your behaviour to attune to the behaviour of others.

### 3.2.3 | Internal consistency

Both factors showed acceptable internal consistency for the Cognitions scale (McDonald's Omega = .71, Cronbach's Alpha = .71) and moderate internal consistency for Behaviour scale (McDonald's Omega = .67, Cronbach's Alpha = .66). Although higher internal consistency would be preferable, the limited number of items might affect internal consistency negatively (e.g., Taber, 2018). Looking at the full scale, internal consistency was acceptable (McDonald's Omega = .75, Cronbach's Alpha = .75).

## 3.3 | Confirmatory factor analysis

Confirmatory factor analysis (CFA) was used to assess the consistency of the 11-item two-factor questionnaire structure in another sample (Sample 2; Table 1). The chi-square test of model fit was not significant ( $\chi^2[43, N = 203] = 58.781$ ,  $p = .055$ ), fit indices indicate that model fit was acceptable to good (RMSEA = .04, TLI = .93) and factor covariance (cov = .41, SE = .08,  $p < .001$ ) showed sufficient discriminant validity between the factors (Table 4).

**TABLE 2** Overview of factor structure and item properties resulting from final exploratory factor analysis

Item # 11-item	Item # 26-item	Factor 1	Factor 2	KMO	Uniqueness	Mean	SD	Median	Range
2	4	.55	-.10	.79	.74	2.86	1.32	3	1:7
3	6	.53	-.02	.82	.73	3.20	1.54	3	1:7
5	12	.63	.13	.74	.51	5.00	1.37	5	1:7
6	13	.39	.03	.89	.83	3.26	1.48	3	1:7
8	17	.78	-.07	.71	.44	4.31	1.63	5	1:7
1	3	.15	.56	.79	.58	4.20	1.55	5	1:7
4	9	-.07	.43	.76	.84	4.31	1.49	5	1:7
7	14	-.00	.68	.77	.54	4.62	1.52	5	1:7
9	20	.15	.38	.84	.77	4.61	1.39	5	1:7
10	21	-.14	.47	.76	.83	5.17	1.42	6	1:7
11	22	.14	.35	.87	.81	5.28	1.05	5	2:7
Subscale 1 – Cognitions	-	-	-	-	-	18.62	4.98	19	6:30
Subscale 2 – Behaviour	-	-	-	-	-	28.19	5.17	29	12:40
Full scale	-	-	-	.78	-	46.80	8.42	47	22:67

Note. Rotation method applied is promax. Only factor loading > .30 are presented. N = 373.

TABLE 3 Final dutch 11-item social attunement questionnaire

Item # 11-item	Item	Item # 26-item	Factor
1	Ik gedraag mij weleens op een manier die niet echt bij mij past omdat dit beter aansluit op de situatie.	3	2
ENG	<i>I sometimes behave differently from how I normally would, because it suits the situation better.</i>		
2	Ik heb er geen probleem mee om anders te zijn dan de mensen in de groep waarin ik me bevind. (R)	4	1
ENG	<i>I do not have a problem with being different from the people in the group I am in.</i>		
3	Ik probeer te voorkomen dat anderen denken dat ik anders ben.	6	1
ENG	<i>I try to prevent people from thinking that I am different.</i>		
4	Ik neem vaak woorden van een ander over.	9	2
ENG	<i>I often adopt words into my vocabulary that I hear others using.</i>		
5	Ik hecht veel waarde aan hoe mensen over mij denken.	12	1
ENG	<i>It really matters to me what people think of me.</i>		
6	Als de meerderheid van een groep een bepaalde mening heeft, ga ik daar meestal in mee.	13	1
ENG	<i>When the majority of a group has a certain opinion, I usually agree.</i>		
7	In verschillende situaties met verschillende mensen gedraag ik mij anders.	14	2
ENG	<i>In different situations with different people, I often behave very differently.</i>		
8	Het kan mij weinig schelen wat anderen van mij vinden. (R)	17	1
ENG	<i>I do not care much about what others think of me.</i>		
9	Als ik niet goed weet hoe ik me moet gedragen, kijk ik naar wat anderen doen.	20	2
ENG	<i>When I do not know how to behave, I look at what others do.</i>		
10	Ik pas mijn taalgebruik aan aan mijn gezelschap.	21	2
ENG	<i>I adjust my language to who I am with.</i>		
11	Ik probeer zo goed mogelijk aansluiting te vinden bij de groep waarin ik mij bevind.	22	2
ENG	<i>I try to align myself as good as possible to the group I'm with.</i>		

Note. Participants were asked to answer using a 7-point likert scale (English: 1 = Completely disagree, 2 = disagree, 3 = more or less disagree, 4 = neutral, 5 = more or less agree, 6 = agree, 7 = Completely agree; Dutch: 1 = helemaal mee oneens, 2 = oneens, 3 = een beetje mee oneens, 4 = neutral, 5 = een beetje mee eens, 6 = mee eens, 7 = helemaal mee eens) and all items followed by (R) are reverse coded items; ENG = English translation (included here for clarification purposes only).

TABLE 4 Confirmatory factor analysis results

Item # 11-item	Item # 26-item	Factor	Estimate	SE	Z-value	p-value	Mean	SD	Median	Range
2	4	1	.40	.09	4.31	<.001	2.52	1.22	2.00	1:7
3	6	1	.59	.13	4.70	<.001	2.97	1.66	2.00	1:7
5	12	1	.31	.12	11.33	<.001	4.43	1.53	5.00	1:7
6	13	1	.39	.11	3.63	<.001	2.86	1.40	2.00	1:7
8	17	1	.14	.12	9.48	<.001	3.78	1.62	4.00	1:7
1	3	2	.81	.14	5.84	<.001	4.07	1.73	5.00	1:7
4	9	2	.48	.13	3.77	<.001	3.74	1.56	4.00	1:7
7	14	2	.93	.12	7.90	<.001	4.62	1.49	5.00	1:7
9	20	2	.95	.13	7.57	<.001	4.15	1.58	5.00	1:6
10	21	2	.65	.13	5.18	<.001	4.98	1.54	5.00	1:7
11	22	2	.61	.10	5.92	<.001	4.90	1.29	5.00	2:7
Subscale 1 – Cognitions	–	–	–	–	–	–	16.56	4.78	17.00	5:29
Subscale 2 – Behaviour	–	–	–	–	–	–	26.46	5.53	28.00	12:39
Full scale	–	–	–	–	–	–	44.59	8.82	46.00	20:69

Note: SE, standard error; SD, standard deviation; N = 203.

### 3.3.1 | Internal consistency

Assessment of the internal consistency of both subscales in sample 2, showed moderate internal consistency for the *Cognitions* subscale (McDonald's Omega = .67, Cronbach's Alpha = .64), the *Behaviour* subscale (McDonald's Omega = .65, Cronbach's Alpha = .64), and the full scale (McDonald's Omega = .67, Cronbach's Alpha = .69).

## 3.4 | Measurement invariance

### 3.4.1 | Measurement invariance to gender

First, the fit of the 11-item 2-factor structure was assessed for both subgroups (men and women). Confirmatory factor analysis (CFA) showed that this structure fit similarly well in both groups, with the chi-square test also being significant in both groups, but other fit indices indicating acceptable to good fit (Table 5). Second, configural invariance was assessed using group CFA in which the number of factors and their pattern was kept equal across groups (Table 5). Although the chi-square test was significant, other indices of model fit indicated acceptable to good fit and all factor loadings were significant. Third, metric invariance was assessed using group CFA in which the factor loadings were also kept equal across groups (Table 5). Results showed that the fit did not worsen significantly ( $\Delta CFI < .010$  &  $\Delta RMSEA < .015$ ), indicative of acceptable metric invariance. Similar results were found for scalar invariance, in which intercepts were also kept equal across groups, and strict factorial invariance, in which residual variances were also kept equal across groups (Table 5).

### 3.4.2 | Gender differences in social attunement

Including all individuals who identified as either a man ( $N = 266$ ) or woman ( $N = 308$ ), results showed no significant difference between men (*Cognitions* subscale:  $M = 18.05$ ,  $SD = 4.98$ ; Full scale:  $M = 41.89$ ,  $SD = 8.08$ ) and women (*Cognitions* subscale:  $M = 17.72$ ,  $SD = 5.03$ ; Full scale:  $M = 40.85$ ,  $SD = 7.89$ ) on the *Cognitions* subscale ( $t(572) = .78$ ,  $p = .44$ ,  $d = .065$ ) and the full scale ( $t(572) = 1.56$ ,  $p = .12$ ,  $d = .078$ ). However, there was a small but significant difference between men and women on the behaviour subscale ( $t(572) = 2.44$ ,  $p = .02$ ), with men ( $M = 28.15$ ,  $SD = 5.45$ ) scoring higher than women ( $M = 27.06$ ,  $SD = 5.24$ ,  $d = .122$ ).

## 3.5 | Convergent and divergent validity

In line with expectations, we found either no association or a negative association between social attunement scores and the need for cognition (Table 6). Also, there was no association between the social attunement scores and non-social potency. However, conformity was associated positively with the social attunement scales. The pattern of the association between social attunement and the other social reward scales did not fully match our expectations. For the admiration and social scales, the *Cognitions* subscale did not match our expectations, but the *Behaviour* subscale and the full scale did. Against expectations, SAQ scores were associated positively with the passivity scale (no association was expected) and SAQ scores were not associated with the pro-social interaction scale (positive association expected).

TABLE 5 Measurement invariance

Subgroup	$\chi^2$	df	p-value	RMSEA	90% CI	$\Delta$ RMSEA	p-value*	CFI	$\Delta$ CFI
Men	78.68	43	<.001	.06	.04–.08	–	.29	.93	–
Women	105.35	43	<.001	.07	.05–.09	–	.03	.88	–
<b>Configural</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>	<b>RMSEA</b>	<b>90% CI</b>	<b><math>\Delta</math> RMSEA</b>	<b>p-value*</b>	<b>CFI</b>	<b><math>\Delta</math> CFI</b>
	184.03	86	<.001	.06	.05–.08	–	.05	.91	–
<b>Metric</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>	<b>RMSEA</b>	<b>90% CI</b>	<b><math>\Delta</math> RMSEA</b>	<b>p-value*</b>	<b>CFI</b>	<b><math>\Delta</math> CFI</b>
	195.58	95	<.001	.06	.05–.07	.002	.07	.90	.003
<b>Scalar</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>	<b>RMSEA</b>	<b>90% CI</b>	<b><math>\Delta</math> RMSEA</b>	<b>p-value*</b>	<b>CFI</b>	<b><math>\Delta</math> CFI</b>
	206.97	104	<.001	.06	.05–.07	.002	.11	.90	.002
<b>Strict</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>	<b>RMSEA</b>	<b>90% CI</b>	<b><math>\Delta</math> RMSEA</b>	<b>p-value*</b>	<b>CFI</b>	<b><math>\Delta</math> CFI</b>
	215.12	115	<.001	.06	.04–.07	.004	.22	.91	.003

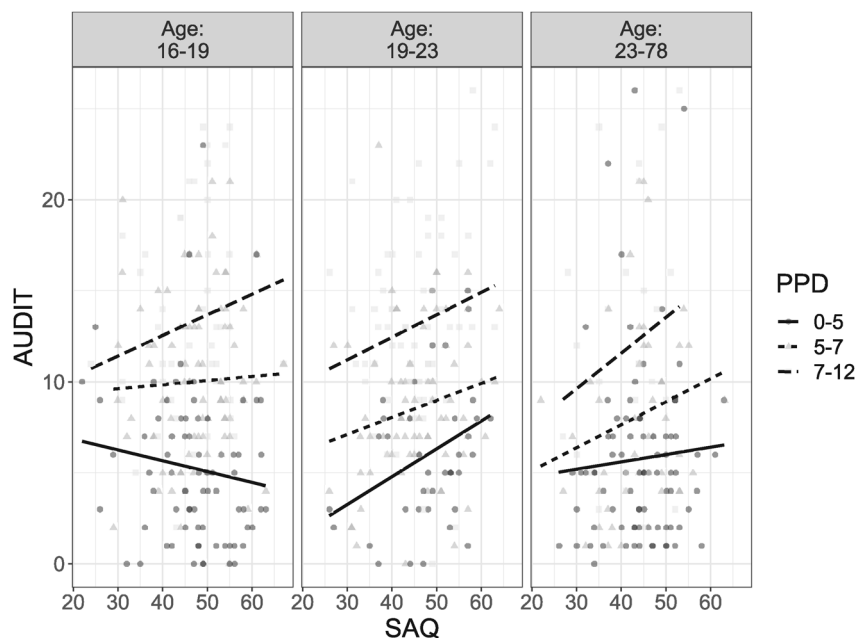
Note: RMSEA < .05 = good fit; RMSEA < .08 = acceptable fit; CFI > .9 = acceptable fit;  $\Delta$ CFI < .010 = non-significant worsening of fit;  $\Delta$ RMSEA < .015 = non-significant worsening of fit.

\* p-value assessing close fit (RMSEA < .05).

**TABLE 6** Correlational analysis to assess convergent and divergent validity

Scale	Subscale 1 - Cognitions				Subscale 2 - Behaviour				Full SAQ				Internal consistency			
	Exp	df	r	p	Results	r <sub>s</sub>	p	Results	r	p	Results	r <sub>s</sub>	p	Results	ω	α
Need for cognition	ns	193	-.27	<.001	-	-.06	.40	ns	-.20	<.01	-				.86	.86
<b>Social reward</b>																
Admiration	+	193	.06	.38	ns	.32	<.001	+	.24	<.001	+				.79	.73
Non-social potency	ns	193	-.03	.65	ns	.14	.05	ns	.08	.26	ns				.67	.63
Passivity	ns	193	.29	<.001	+	.26	<.001	+	.34	<.001	+				.83	.83
Pro-social interaction	+	193	-.08	.28	ns	-.01	.94	ns	-.06	.43	ns				.69	.68
Social	+	193	.05	.47	ns	.22	<.01	+	.18	.01	+				.40	.29
<b>Conformity</b>																
Conformity	+	201	.16	.02	+	.31	<.001	+	.30	<.001	+				.43	.41

Note: df, degrees of freedom; exp, expectations; na, not applicable; ns, not significant; p, p-value; r, pearson correlation coefficient; r<sub>s</sub>, spearman correlation coefficient; ω, McDonald's Omega; α, Cronbach's Alpha; +, positive association—negative association.



**FIGURE 2** The relationship between age, social attunement score (SAQ) and perceived peer drinking (PPD) in their Association with Alcohol Use (AUDIT). The association between SAQ and AUDIT, displayed in three panels that represent age groups (tertiary split for visualisation purposes) with three lines representing differing levels of perceived peer drinking (tertiary split for visualisation purposes). Results suggest that the association between AUDIT and SAQ depends on the interaction between age and PPD. There is a more distinct effect of PPD on the association between SAQ and AUDIT in the relatively younger mid-late adolescent age group (panel 1). Also, it becomes clear that AUDIT score is associated with perceived peer drinking in all age groups (all panels, different lines in same order).

### 3.6 | Age, social attunement and alcohol consumption

Correlation analyses were performed to assess how PPD, age, SAQ and AUDIT were associated with each other. Results show that age was associated negatively with AUDIT ( $r_s = -.10, p = .02$ ; Internal consistency:  $\omega = .83, \alpha = .79$ ) and SAQ ( $r_s = -.21, p < .001$ ; Internal consistency:  $\omega = .74, \alpha = .74$ )—older individuals showed less alcohol use and related problems as well as less social attunement. Furthermore, AUDIT related positively with PPD ( $r_s = .57, p < .001$ ; Internal consistency:  $\omega = .83, \alpha = .66$ ), showing an association between perceived peer drinking and own drinking behaviour. Regression analyses were performed to assess how age, PPD and SAQ were associated and interacted in their association with AUDIT. Results showed that both SAQ score ( $B = .09, p = .02$ ) and the interaction between age and PPD ( $B = -.34, p = .002$ ) were predictive of AUDIT scores ( $F(4, 537) = 60.35, p < .001$ ;  $R^2 = .31$ ;  $N = 541$ ). Using tertiary splits for the age and PPD variables to visualise these interactions, Figure 2 shows that the association between SAQ and AUDIT is dependent on PPD and age—higher SAQ appears related to lower AUDIT only in relatively younger (Age: 16–19) individuals who reported relatively lower levels of peer drinking (PPD: 0–5). Furthermore, we found positive associations between SAQ score and all four motives for alcohol consumption measured with the DMQ: social ( $r_s = .24, p < .001$ ; Internal consistency:  $\omega = .88, \alpha = .86$ ), conformity ( $r_s = .36, p < .001$ ; Internal consistency:  $\omega = .81, \alpha = .80$ ), coping ( $r_s = .26, p < .001$ ; Internal consistency:  $\omega = .80, \alpha = .79$ ), and enhancement ( $r_s = .13, p = .002$ ; Internal consistency:  $\omega = .84, \alpha = .82$ ). Exploratory additional regression models were run to assess whether social and conformity drinking motives (separately) would explain additional variance in the regression model presented above. Results showed that, when adding conformity motives to the model ( $F(5, 525) = 45.11, p < .001$ ;  $R^2 = .30$ ;  $N = 525$ ),



the interaction between PPD and age remained a significant predictor of AUDIT ( $B = -.32, p = .004$ ), but that this was not the case for SAQ ( $B = .07, p = .07$ ) and conformity ( $B = .05, p = .21$ ). When adding social motives to the model ( $F(5, 525) = 58.57, p < .001; R^2 = .35; N = 525$ ), the interaction between PPD and age also remained a significant predictor of AUDIT ( $B = -.25, p = .02$ ), although this was not the case for SAQ ( $B = .03, p = .37$ ). However, social motives were a significant predictor of AUDIT ( $B = .28, p < .001$ ) in this model.

## 4 | DISCUSSION

The social attunement questionnaire (SAQ) was developed to be able to assess social attunement, the extent to which one adapts to and harmonises behaviour with the social environment (Cousijn et al., 2018) in different social situations. The resulting 11-item SAQ contained two subscales capturing the *Cognitions* (subscale 1) and *Behaviour* (subscale 2) related to social attunement, showing good psychometric properties that were consistent over genders. Furthermore, results largely confirmed our expectations on how SAQ scores, together with perceived peer drinking and age could predict alcohol use in a sample of mid to late adolescents and adults. The pattern of results from the analyses assessing convergent and divergent validity generally confirmed a good fit between the 11-item SAQ and our conceptual framework of social attunement but also provided novel insights to be tested in future studies. Below we will first discuss the structure and psychometric properties of the SAQ, followed by an in-depth discussion of theoretical and practical research implications.

The five items included in the *Cognitions* subscale assess the extent to which individuals think about their own behaviour and about how others perceive that behaviour. The six items included in the *Behaviour* subscale assess the actual behaviour someone performs in response to their environment to adapt to and harmonise with this environment. The 15 deleted items primarily included examples of cognitions and behaviours that also are reflected in the remaining items, suggesting that these items did not generalise well enough over individuals to be included in the SAQ. The structure that resulted from our exploratory factor analysis (EFA) was confirmed using confirmatory factor analysis (CFA) in another sample, that varied from the first sample on all included variables (Table 1). Although additional replication of these CFA results in a sample that matches the EFA sample would be recommended highly, the factor structure confirmation in a sample that is dissimilar increases the likelihood of generalisability of the measure in a variety of Dutch samples. Notably, both the EFA and CFA showed significant chi-square tests, which indicates poor fit (Sun, 2005). However, it is well-known that chi-square tests of fit can be overly sensitive when the sample size is relatively large (e.g., Bollen, 1989; Miles & Shevlin, 2007; Tucker & Lewis, 1973), and other fit indices indicated acceptable to good fit in both analyses (Sun, 2005). In addition, the assessment of different measures of measurement invariance confirmed invariance to gender in this sample. In both samples separately, the internal consistency of the SAQ was moderate-acceptable, and in the samples combined, internal consistency was acceptable-good (Lance et al., 2006; Tavakol & Dennick, 2011). Although internal consistency was lower than anticipated, it is in line with the nature of the SAQ, which assesses complex human behaviour and the limited number of items per subscale (5–6 items each), lowering internal consistency levels which one may expect to be in the .65–.80 range in case of Cronbach's alpha (Vaske et al., 2017). This latter point is supported by the fact that the full scale (11 items) showed higher internal consistency. Furthermore, the factor analytic evidence of unidirectionality of the items provide additional confidence in the psychometric properties of the SAQ. However, future studies using the SAQ should evaluate the internal consistency of the subscales carefully to confirm these results.

In line with our conceptual framework of social attunement, the *Cognitions* but not the *Behaviour* subscale correlated negatively with the need for cognition scale, suggesting a cognitive component that differentiates between more subjective social cognition (e.g., 'I try to prevent people from thinking that I am different.') and the more objective cognitive processes as assessed with the need for cognition questionnaire (e.g. 'I really enjoy a task that involves coming up with new solutions to problems'; Cacioppo & Petty, 1982; Verplanken et al., 1992). Furthermore, the *Behaviour* but not the *Cognitions* subscale correlated positively with the social and admiration scale of the social

reward questionnaire. The behaviour assessed by the social and admiration scales of the social reward questionnaire might indeed be similar to some of the behaviours assessed by the 'Behaviour' scale of the SAQ (e.g., 'I try to align myself as good as possible to the group I'm with'). However, the cognitive process behind these behaviours might be very dissimilar, explaining the differences in associations and highlighting the importance of the *Cognitions* scale to capture the full social attunement process. As expected, conformity (peer pressure/obedience) and social attunement (positive reinforcement) correlated positively, but substantial SAQ variance cannot be explained by conformity (highest  $r = .31$  for the *Behaviour* subscale).

In contrast to our expectations, the SAQ correlated positively with passivity ('giving others control and allowing them to make decisions'; Foulkes et al., 2014) but not with pro-social interaction ('having kind, reciprocal relationships'; Foulkes et al., 2014) of the social reward questionnaire. However, speculatively, more passive individuals may score higher on social attunement because they more often adapt to others rather than deciding for themselves. The lack of association between the SAQ and pro-social interaction subscale of the social reward questionnaire, was also unexpected. This latter subscale focuses on the nature and type of relationships. Although we expected that individuals with relatively more 'kind, reciprocal relationships' would score higher on social attunement, our results suggest that the nature or the type of relationships does not affect social attunement directly to the individuals within this relationship.

We assessed how the SAQ related to drinking motives. Unexpectedly, the SAQ correlated positively with all drinking motives, a result that could not be explained by general higher alcohol consumption in individuals with higher social attunement scores. Importantly, although social and conformity drinking motives are intuitively more 'social' than enhancement and coping motives, the drinking motives questionnaire does not distinguish between the (social) settings in which drinking occurs (Cooper, 1994). Social factors could play a role in all drinking motives. For example, some may specifically drink to enhance positive affect in social settings (e.g., party) or to cope with negative affect during social situations, whereas others would drink to enhance positive affect or cope with negative affect in non-social settings (e.g., drinking alone). The positive association between the SAQ and all drinking motives, supported by the general notion that trajectories of alcohol use are more problematic in non-social versus social drinkers (e.g., Crutzen et al., 2013; Kuntsche et al., 2006; Mann et al., 1987), suggest that it also could be useful to develop a drinking motives questionnaire that distinguishes between drinking in social and non-social settings. We hypothesise that specifically non-social coping and enhancement will be associated negatively with social attunement and be a risk factor for long term problems, whereas social coping and enhancement would be associated positively with social attunement and could be indicative of a higher chance of maturing out.

In line with the general theories of social development (Steinberg, 2005), social attunement was highest in the mid to late adolescent age range and significantly decreased with age. Also, those with higher perceived peer drinking consumed more alcohol themselves, whereas no direct association between social attunement and alcohol use was found. However, further analysis revealed that perceived peer drinking and age interacted and, together with social attunement, were predictive of alcohol use. These results indicate that higher social attunement is associated with higher alcohol use in those individuals who perceive high peer drinking, but that the effect of peer drinking decreases with increasing age. This result is in line with the idea that peers could be particularly influential during adolescence (e.g., Gardner & Steinberg, 2005) and thereby affect alcohol use initiation and escalation during mid to late adolescence specifically. However, it is important to note that the age distribution was skewed towards younger participants (i.e., very limited number of participants over 40 years old), and longitudinal data are needed to investigate the development of social attunement with age, and its effect, as well as the effect of perceived peer drinking, on alcohol use across multiple age groups.

As there were positive associations between SAQ and both social drinking motives (social and conformity), we assessed whether the predictive effects of SAQ, peer drinking and age on alcohol use remained similar when including these drinking motives as predictors. Results showed that social drinking motives explained variance in alcohol use while accounting for the interaction between age and perceived peer drinking, whereas social attunement was not a significant predictor in this model. Adding conformity drinking motives to the model resulted in the interaction

between age and perceived peer drinking to be the only significant predictor of alcohol use. However, it should be noted that the relatively high correlation of SAQ scores with both motives warrant careful interpretation. So, although social drinking motives also appear to explain additional variance in the association of age and perceived peer drinking with alcohol use, the strength of the SAQ is that it has the potential to be used to assess social attunement in both alcohol-use-related as well as more general settings, whereas this is not the case for the measures of drinking motives. Future studies are needed to assess the utility of the SAQ beyond alcohol use. For example, the SAQ might be a useful tool to assess one's general tendency to attune to adaptive (e.g., prosocial behaviour) and maladaptive peer behaviours (e.g., delinquency, unsafe sex or unsafe driving) across different life stages and social settings (e.g., school, work, family).

Aside from studying applicability of the SAQ across developmental trajectories and a range of social settings, several additional steps should be taken to assess the validity of the SAQ. The current study only collected limited demographic data from participants and future studies should collect a wider range of variables to assess measurement invariance to for example SES, ethnicity, and more detailed measures of educational level. An English translation of the SAQ is available which will—once validated—enable us and others to assess how fundamental differences between countries and cultures might affect both social attunement and its association with perceived peer drinking and alcohol use in different age groups. In line with this, future studies are encouraged to assess how social attunement is associated with descriptive and injunctive norms (Krieger et al., 2016) and how an individual's inter and intra group assertiveness (Korem et al., 2012) and autonomy (Helwig, 2006) affects social attunement over one's development depending on the cultural background. Moreover, assessments of test-retest reliability are needed to assess within person stability of social attunement through development.

In conclusion, the two subscales of the SAQ appear to capture both the *Cognitions* and *Behaviour* components of social attunement, showing good measurement invariance to gender. Our newly developed instrument appears to be suitable to gain important insights into the role of social attunement in development and substance use, however, more studies are needed to test the SAQ's utility in broader samples and situations.

## AUTHOR CONTRIBUTIONS

All authors reviewed and approved the final version. *Conceptualization*: Gabry Mies, Janna Cousijn and Emese Kroon; *Methodology*: Janna Cousijn, Gabry Mies and Emese Kroon; *Investigation*: Emese Kroon and Gabry Mies; *Formal Analysis*: Emese Kroon, Gabry Mies, Reinout W. Wiers and Janna Cousijn; *Data curation*: Emese Kroon, Gabry Mies and Janna Cousijn; *Writing – Original draft*: Emese Kroon; *Writing – Review & Editing*: Janna Cousijn, Gabry Mies and Reinout W. Wiers; *Visualization*: Emese Kroon; *Supervision*: Janna Cousijn, Gabry Mies and Reinout W. Wiers; *Funding Acquisition*: Janna Cousijn.

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## DATA AVAILABILITY STATEMENT

The data, code and materials of this study are available from the corresponding author upon reasonable request.

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Additional supporting information can be found online in the Supporting Information section at the end of this article.

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