

Social Skills and Behavioral Problems in Adolescents with Child Sexual Abuse, and Their Relation to Basal Cortisol

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Abstract

Child sexual abuse (CSA) is a stressful associated with alterations in the hypothalamic-hypophyseal-adrenal (HPA) axis and behavioral problems. Children and adolescents with history of CSA could have higher cortisol levels, as these have been associated with deleterious changes in brain regions involved in controlling social behavior and self-control. The aim of the present study was to determine the relationship among basal cortisol levels, social skills and behavioral problems in adolescents with CSA by evaluating two groups: one consisting of 12 - 15-year-old girls with CSA (n = 23), the other healthy comparison adolescents with no history of child abuse (n = 23). Social skills and behavioral problems were assessed using the Social Skills Improvement System. Three saliva samples were collected from each participant. The girls with CSA had lower social skills and more behavioral problems, as well as, higher cortisol concentrations. Besides, these participants showed significant negative correlations among cortisol levels and social skills, as well as, positive correlations with behavioral problems scales. It is feasible to suggest that the social deficiencies observed in these participants with CSA are related to alterations of the HPA.

Keywords

Adolescents, Behavioral Problems, Child Sexual Abuse, Cortisol, Social Skills

1. Introduction

Adolescence is characterized by social reorientation [1] when individuals discover that they face new social challenges and must adapt to numerous internal physical, cognitive and emotional changes. This transition towards becoming

independent, responsible adults is inherently intertwined with adjustments of personal goals and motivations. This developmental stage involves greater use of top-down cognitive control to modify attention, emotions and behaviors in order to achieve more “adult” social skills, defined as the ability to interact with other people in a ways that are both appropriate and effective [2] for building and maintaining healthy relationships, thus, their evolution plays a crucial role in individuals’ cultural experience [3].

The construct of social skills contains several dimensions: taking perspective (cognitive), empathy (emotional), cooperation and self-control (behavioral), among others [4]. Good social skills can facilitate managing stressors to prevent the development of subsequent adverse outcomes. Deficits in social skills, in contrast, create behavioral problems and a propensity towards developing psychosocial problems when experiencing stress [5].

On the other hand, child sexual abuse (CSA) is defined as involving children or adolescents in sexual activities that they cannot comprehend, or for which they are developmentally unprepared and unable to give informed consent [6]. Preadolescent girls are at greater risk of being abused by males who are usually known to them, since family members account for 38.3% of cases, with acquaintances being responsible for another 46.3% [7].

This type of abuse has consequences for the social functioning of victims like poor peer relationships, less interactive play, low emotional regulation, deficits in self-control [8], and social withdrawal [9]. Deficits in social skills may also predispose maltreated individuals to suffer behavioral problems, such as peer rejection [10], sexualized behavior [11], self-injurious behavior, attempts to commit suicide [12], low school performance, and alimentary disorders [13], as well as psychopathic traits in adulthood [14]. In addition, victims tend to have fewer friends and social contacts in adulthood with more severe problems of social adaptation. CSA has also been related to long-term psychopathologies like posttraumatic stress disorder (PTSD), depression and anxiety [15].

CSA is a stressful event that causes deregulation of the hypothalamic-pituitary-adrenal (HPA) although the direction of this shows inconsistencies in literature. Although there are exceptions [16], several studies have shown that children and adolescents exposed to severe child abuse and neglect have higher levels of nonstress cortisol than comparison individuals [17] [18] [19] [20] [21]. In contrast, studies of adults retrospectively reporting childhood abuse have found lower levels of cortisol during the course of the day [22] and in response to hormonal or physical challenge [23] [24].

This excess cortisol, especially in childhood and adolescence, could affect brain regions characterized by late post-natal development and high densities of glucocorticoid receptors [25], such as the hippocampus [26], amygdala [27], temporal lobe [28], anterior cingulate [29], and prefrontal cortex [30]; that is, the structures that make up the cortical-limbic circuits that play a fundamental role in social skills and self-regulation [3] [31].

The research cited above supports the presence of vulnerability towards developing deficits in social skills in adolescent girls exposed to CSA, related to the hyper-secretion of cortisol which affects the cortical-limbic circuits involved in social behavior and emotional processing. These deficits can, in turn, provoke behavioral problems that generate even greater stress and, with this, increased cortisol secretion and more changes in the brain. Against this background, the aim of the present study was to determine the relationship among basal cortisol levels, social skills and behavioral problems in a group of female adolescents with child sexual abuse. We hypothesize that a correlation will exist between basal cortisol levels and scores on a test that measures social skills and behavioral problems, and that the girls with CSA will have lower social skills, more behavioral problems and higher cortisol levels.

2. Materials and Methods

2.1. Participants

A total of 46, 12 - 16-year-old adolescent girls were evaluated, 23 with child sexual abuse (CSAG) and 23 healthy comparison participants without abuse background. All the participants with CSA came from foster homes where they had lived for between 6 months and 5 years so that none of them was institutionalized before the age of 8. The girls in the CSA group were institutionalized to protect them from the recurrent intra-family sexual abuse of which they were victims, and because they had no family members who could care for them. These girls had suffered rape or caresses of their sexual organs. Their abusers had been stepfathers, stepbrothers, fathers and brothers. In addition, some of them had suffered negligence, physical and psychological abuse or had witnessed domestic violence which are adversities that often accompany child sexual abuse. We confirmed that participants had histories of intra-familial CSA by reviewing files held at the foster homes, interviewing caregivers, and applying the Child Abuse Screening Tool-Children's Version (ICAST-C) [32].

The participants with CSA were recruited from three foster homes registered under the Mexican Official Norms for Assistance Services for Children (Nom-167-SSA1-1997), which ensured that their needs for housing, education, clothing, food, and mental and physical health services had all been attended to. They studied in public schools outside their foster homes.

The participants of the healthy comparison group (HCG) were recruited from a public school located in an area of the metropolitan area of Guadalajara, Mexico, with a medium-low socioeconomic level. All of them lived with their families, and had no history of maltreatment or neglect according to the ICAST-C [32]. This questionnaire was applied by a clinical psychologist.

All participants had normal IQs according to the brief form of the Wechsler Intelligence Scale for Children Fourth Edition (WISC-IV) [33] (Table 1), were regular students, and did not suffer from attention deficit disorder according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth

Table 1. Characteristics of the healthy comparison (HCG) and child sexual abuse (CSAG) groups with parametric comparisons.

	HCG		CSAG		Comparisons		
	Mean	SD	Mean	SD	T_{df}	p	d
Age	13	1.17	12.95	1.4	-0.115	0.909	0.039
Intelligence quotient (IQ)	84.32	4.43	82.78	5.88	-1.084	0.285	0.296
Child PTSD Symptom Scale (CPSS)	6.48	7.77	44.96	11.76	13.089	<0.001	-3.86
Spence Children's Anxiety Scale (SCAS)	49	7.91	59.39	8.73	4.23	<0.001	-1.25
Children's Depression Inventory (CDI)	42.04	7.56	55.91	5.90	6.93	<0.001	-2.05
Age of the last episode of sexual abuse	9.4	1.67					
Time of institutionalization	2.9	1.55					

Columns 4, 5 and 6 present the t_{df} values, significance (p) and size effect (Cohen's d) of the t tests conducted to compare the group values for each variable. N: HCG = 23; CSAG = 23.

Edition (DSM-5) [34]. Subjects in the two groups had failed a maximum of one school grade. They were all healthy and had no prior history of neurological disorders, learning disabilities, drug abuse or chronic illness. These aspects were evaluated throughout a clinical history extracted from the Child Neuropsychological Assessment ENI [35], which was applied to parents, caregivers, or foster-home psychologists.

No participant was taking any drugs with effects on the central nervous system, or oral contraceptives during the assessment period. Subjects in HCG were matched with those in CSAG with respect to age, IQ scores, sex, socioeconomic status, school grade and type of school (public).

To select the sample, we interviewed each participant and her parents or advisors. In addition, we applied the ICAST-C [32] to determine the kind of abuse that the subjects had suffered. To further characterize the sample, the Child PTSD Symptom Scale (CPSS) [36], Children's Depression Inventory (CDI) [37] and Spence Children's Anxiety Scale (SCAS) [38] were also applied to ascertain the presence of symptoms of posttraumatic stress disorder, depression and anxiety respectively.

All procedures involved in this research were approved by the Ethics Committee of the Institute of Neuroscience (registration number ET112015-208) in accordance with the ethical standards laid down in the 1964 Helsinki Declaration. All participants and their parents or care-givers gave their informed consent prior to inclusion in the study.

2.2. Evaluations of Social Skills and Behavioral Problems

The Social Skills Improvement System Rating Scales, SISS [39], were used. This instrument permits targeted assessments of individuals aged 3 - 18 years and small groups to help evaluate social skills, problem behaviors, and academic competence. In this study, only the first two aspects were evaluated. The items

used to assess them are classified in 7 social skills sub-scales-communication, cooperation, assertion, responsibility, empathy, engagement, self-control-and five behavioral problem sub-scales: externalizing, bullying, internalizing, hyperactivity/inattention, and an autism spectrum. SISS generates two indices: total social skills and total behavioral problems. It can be answered by teachers, parents (or caregivers), and students, but for our purposes only the adolescent girls and their parents or caregivers filled out questionnaires. The survey designed for students asks how “true” items are, from “Not true” to “Very true”, while the parents’ version provides frequency-based ratings on a 4-point scale from “Never” to “Almost always”.

The scales have a good internal consistency since alpha values are between 0.94 and 0.96 and the sub-scales between 0.73 and 0.96. We calculated the internal consistence of the scales applied in our sample. In Social Skills, this analysis showed that the alpha values for the participants scale was 0.934, while in the parents/care-givers scale was 0.937. In behavioral Problems, the alpha values for participants scale was 0.914 and in the parents/care-givers scale 0.943. The alpha values in each sub-scale of our sample are presented in **Table S1**. The statistical analyses were made with raw scores.

2.3. Cortisol Measurements

We were only able to analyze the saliva samples of 36 participants (18 in each group) because some girls had gum bleeding, canker sores or an infectious disease (e.g. flu). Three samples were taken on two consecutive days between days 4 and 7 after menstruation. On each day, the first sample was taken in the morning as soon as the participant awoke, while the second was taken half an hour later (before eating or brushing their teeth). The third sample was taken at night just before going to bed. These three samples were taken because cortisol functioning in healthy children and adults follows a consistent diurnal pattern with peak levels of output observed within the first 30 - 40 min after awakening followed by a progressive reduction throughout the morning with a lowest point in the afternoon [40] [41] [42].

Measurements of cortisol levels were performed with the enzyme-linked immunosuppressive assay (ELISA), a competition-based analysis of the interaction between an unknown amount of antigen present in the sample and a fixed amount of enzyme-labeled antigen with which the antigens in the sample compete for the binding sites of the antibodies that line the wells.

After the substrate reaction, the wells were washed to stop the competition reaction. At that point, the intensity of the color is inversely proportional to the amount of antigen in the sample (*i.e.*, the darker the color, the lower the cortisol level measured in $\mu\text{g/mL}$ and vice versa). Results can be determined directly using the standard curve by performing an immunological assay for the in vitro quantitative determination of free cortisol in human saliva. The ALPCO Kit was used for the quantitative determination of the cortisol levels in the saliva samples. For the statistical analyses, the cortisol levels from the two days were aver-

aged to obtain three values: upon waking up, at the morning and at evening.

2.4. Statistical Analyses

For SISS variables, the IQ and the scores of psychopathological test, the data from 46 participants, 23 per group, were analyzed. First, Levene and Shapiro-Wilk tests were run to determine if the data presented equal variances and a normal distribution. Based on those results, Student's *t* tests for independent groups were performed for the IQ and psychopathological data to test for between-group differences. Because the SISS broad scores did not meet the criteria for homoscedasticity and normal distribution, a Mann-Whitney *U* test was used to compare the groups.

In order to determine the congruency between participants and parents/caregivers scales and sub-scales, spearman correlations were calculated with the scores of both questionnaires.

To determine the differences between groups and between saliva samples, split-plot ANOVAS (2 groups \times 3 samples) were performed and then Bonferroni's ex post analysis was carried out to know the meaning of the differences; only the data from 36 were analyzed due to the problems described above. In all cases, the size effects were calculated. Finally, in order to identify possible relationships among cortisol levels, social skills and behavioral problems, a Pearson correlation analysis was done between the cortisol levels in the samples from each day and the broad scores of each SISS scale. These analyzes were done with each group ($n = 18$) and with all participants in both groups ($n = 36$).

For the Student's *t* and Mann-Whitney *U* tests and correlations, the significance level was corrected according to Bonferroni criteria by dividing 0.05 by the number of dependent variables (DV) in each parameter. As a result, the significance for social skills was $p < 0.0072$ ($DV = 7$), for behavioral problems for participants it was $p < 0.0125$ ($DV = 4$), and for behavioral problems for caregivers/parents it was $p < 0.008$. For total social skills and total behavioral problems significance was $p < 0.05$. All statistical analyses were performed in IBM SPSS V22.

3. Results

3.1. Characteristics of the Groups

There were no significant differences between the groups in age or IQ in the Student's *t* analyses (Table 1). But the CSAG showed a higher intensity of symptoms of PTSD, depression and anxiety.

3.2. Comparisons between Groups

Social skills

The Mann-Whitney *U* analysis showed that CSAG had lower social skills than HCG, as they obtained lower scores on the total social skills index and all the social skills sub-scales on the participants' survey (Table 2). Regarding the

Table 2. Nonparametric comparisons between groups of the raw scores of each scale of Social Skills Improvement System Rating Scales (SISS).

		HCG		CSA		Mann-Whitney U	Z	P	r
		Mean	Standard deviation	Mean	Standard deviation				
Social skills									
Participants	Communication	15.26	1.81	10.56	2.97	39.5	-4.97	0.000*	-0.733
	Cooperation	16.74	2.58	11.01	3.61	68.0	-4.34	0.000*	-0.640
	Assertion	14.04	2.98	10.17	3.79	102	-3.59	0.000*	-0.529
	Responsibility	16.30	2.70	10.26	2.16	54.5	-4.63	0.000*	-0.683
	Empathy	13.56	3.11	10.73	2.95	123.5	-3.12	0.002*	-0.460
	Engagement	15.52	3.4	11.74	2.96	106.5	-3.49	0.000*	-0.515
	Self-control	12.30	2.48	6.26	3.35	43.0	-4.87	0.000*	-0.718
	Total social skills	103.43	12.1	71.17	13.78	29.0	-5.18	0.000*	-0.764
Caregivers/parents	Communication	17.08	2.10	12.47	1.98	22	-5.37	0.000*	-0.792
	Cooperation	14.35	1.95	9.96	1.99	31	-5.16	0.000*	-0.761
	Assertion	14.30	3.04	12.60	1.87	169.5	-2.10	0.036	-0.310
	Responsibility	13.78	2.87	9.17	1.56	10	-5.62	0.000*	-0.829
	Empathy	14.22	2.09	9.74	2.4	28	-5.23	0.000*	-0.771
	Engagement	14.15	2.77	12.65	2.9	172.5	-2.04	0.042	-0.301
	Self-control	13.27	2.34	9.74	3.09	93	-3.79	0.000*	-0.559
	Total social skills	101.65	10.91	76.26	9.87	7.50	-5.65	0.000*	-0.833
Behavioral Problems									
Participants	Externalizing	7.26	5.82	14.39	5.07	91.5	-3.81	0.000*	-0.562
	Internalizing	7.08	6.26	10.87	4.82	145.0	-2.63	0.008*	-0.388
	Bullying	2.08	2.04	3.39	2.76	189.5	-1.67	0.095	-0.246
	Hyperactivity/Inattention	5.91	4.78	8.96	3.5	126.5	-3.04	0.002*	-0.448
	Total behavioral problems	16.43	13.24	28.61	8.65	104.0	-3.53	0.000*	-0.520
Caregivers/parents	Externalizing	3.04	3.43	12.35	6.05	49.0	-4.76	0.000*	-0.702
	Internalizing	3.69	3.39	7.57	5.07	134	-2.88	0.000*	-0.425
	Bullying	0.913	1.28	4.47	3.64	105	-3.62	0.000*	-0.534
	Hyperactivity/Inattention	1.39	2.23	5.78	3.29	47.5	-4.81	0.000*	-0.709
	Autism spectrum A	18.43	2.71	14.30	1.77	49	-4.77	0.000*	-0.703
	Autism spectrum B	2.61	1.8	5.30	3.4	123	-3.16	0.002*	-0.466
	Total behavioral problems	7.65	6.14	24.39	11.85	33	-5.09	0.000*	-0.750

*significant differences; r = Cohen' r size effect); N = 46.

caregivers/parents' questionnaire, CSAG had lower scores for total social skills and the communication, cooperation, responsibility, empathy and self-control sub-scales (**Table 2**).

Behavioral problems

Results of the Mann-Whitney U test showed that CSAG had more behavioral problems than HCG. On the participants' questionnaire, they obtained lower scores on the total behavioral problems index and all sub-scales (**Table 2**), while results of the caregivers/parents' questionnaire showed that CSAG had higher scores for total behavioral problems and all sub-scales (**Table 2**).

3.3. Caregiver/Teacher Agreement

As it is shown in **Table 3**, there were significant correlations between participants and parents/care-givers questionnaires in the Social Skills and Behavioral Problems scales and sub-scales.

3.4. Basal Cortisol Concentrations

The ANOVA showed the existence of principal effects for group ($F_{1,34} = 108.63$, $p = 0.000$, $\eta^2 = 0.762$) and sample ($F_{2,68} = 10.03$, $p = 0.000$, $\eta^2 = 0.228$), as well as, an interaction between them ($F_{2,68} = 5.12$, $p = 0.008$, $\eta^2 = 0.131$). CSAG presented higher cortisol levels than HCG in all three samples. Post hoc comparisons indicated that only CSA showed a significant increase at morning sample compared to samples upon waking up and at night (**Figure 1**).

Table 3. Correlations between participants and parents/care-givers scales and sub-scales of Social Skills Improvement System Rating Scales.

	r	p
Social Skills		
Communication	0.672	0.000
Cooperation	0.647	0.000
Assertion	0.522	0.000
Responsibility	0.717	0.000
Empathy	0.422	0.004
Engagement	0.55	0.000
Self-Control	0.45	0.002
Total Social Skills	0.733	000
Behavioral Problems		
Externalizing	0.554	000
Bullying	0.545	0.000
Hyperactivity/Inattention	0.476	0.001
Internalizing	0.453	0.002
Total Behavioral Problems	0.569	0.000

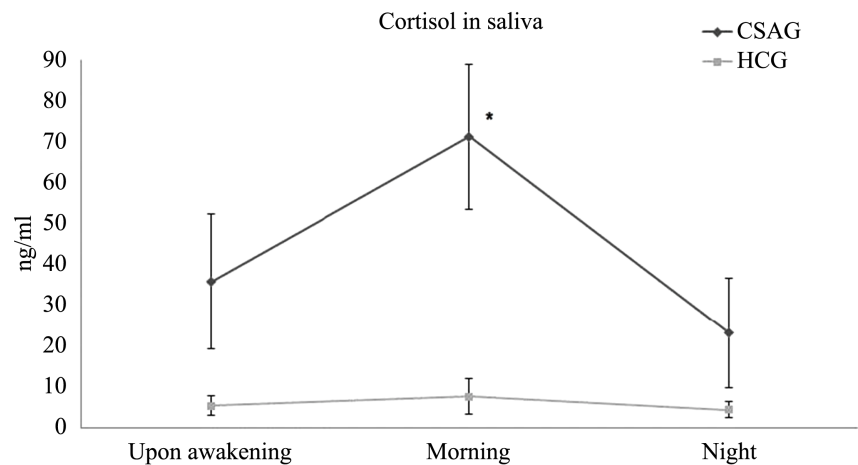


Figure 1. Means of cortisol concentrations in saliva (\pm SE) in each sample collected from the child sexual abuse group (CSAG) and healthy comparison group (HCG). *Significant differences between samples < 0.05 . $N = 36$.

3.5. Correlations among Cortisol Concentrations, Social Skills and Behavioral Problems

The CSAG presented some correlations among cortisol concentrations and SISS scores. First, there were significant negative correlations between cortisol levels in the second sample (30 min after waking up) and the questionnaire answered by parents/care-givers in total social skills scale ($r = -0.533$, $p = 0.023$), as well as, cooperation ($r = -0.609$, $p = 0.007$) sub-scale. In the last, there were a negative correlation with the sample at waking up ($r = -0.472$, $p = 0.048$). In this questionnaire there were also positive correlations between cortisol levels at morning and total behavioral problems scales ($r = 0.541$, $p = 0.02$), as well as, externalizing ($r = -0.5$, $p = 0.035$), hyperactivity/inattention ($r = 0.561$, $p = 0.015$) and autism spectrum B ($r = 0.702$, $p = 0.001$) subscales.

Conversely, in HCG, there was only a significant correlation between the first cortisol sample (at waking up) and assertion subscale of the questionnaire answered by the participants ($r = -0.474$, $p = 0.035$).

Subsequently, correlations were made with the subjects of both groups ($N = 36$). As **Table 4** shows, in the participant's questionnaire, there were negative correlations among all social skills and salivary cortisol and these correlations were more obvious upon awakening. In the caregivers/parents questionnaire, these correlations were observed on the communication, cooperation, responsibility, empathy, and self-control sub-scales, as well as, the total social scale. In contrast, the analyses determined significant positive correlations among cortisol levels in the cortisol samples and the scores of both participants and caregivers/parents' for the total behavioral problems indices with exception of bullying' subscale in the participants' questionnaire.

4. Discussion

As we hypothesized, the participants with CSA had lower social skills, more

Table 4. Pearson's correlations and significance among cortisol levels in saliva, social skills and behavioral problems in the two groups of adolescents (with history of child sexual abuse and healthy comparison group).

		Upon awakening		Morning		Night	
		r	p	r	p	r	p
Social Skills							
<i>Participants</i>	Communication	-0.593	0.000*	-0.574	0.000*	-0.623	0.000*
	Cooperation	-0.558	0.000*	-0.498	0.002*	-0.455	0.000*
	Assertion	-0.543	0.000*	-0.336	0.045	-0.377	0.023
	Responsibility	-0.571	0.000*	-0.451	0.005*	-0.494	0.002*
	Empathy	-0.443	0.005*	-0.452	0.005*	-0.389	0.019
	Engagement	-0.496	0.002*	-0.408	0.012	-0.405	0.014
	Self-control	-0.589	0.000*	-0.512	0.001*	-0.647	0.000*
	Total social skills	-0.697	0.000*	-0.589	0.000*	-0.611	0.000*
<i>Caregivers/parents</i>	Communication	-0.644	0.000*	-0.685	0.000	-0.655	0.000
	Cooperation	-0.720	0.000*	-0.745	0.000*	-0.574	0.000*
	Assertion	-0.246	0.137	-0.273	0.102	-0.157	0.361
	Responsibility	-0.695	0.000*	-0.727	0.000*	-0.625	0.000*
	Empathy	-0.574	0.000*	-0.678	0.000*	-0.648	0.000*
	Engagement	-0.255	0.122	-0.350	0.034	-0.286	0.091
	Self-control	-0.405	0.012	-0.494	0.002*	-0.475	0.003*
	Total social skills	-0.686	0.000*	-0.762	0.000*	-0.670	0.000*
Behavioral problems							
<i>Participants</i>	Externalizing	0.577	0.000*	0.491	0.002*	0.621	0.000*
	Internalizing	0.423	0.008*	0.459	0.004*	0.456	0.005*
	Bullying	0.302	0.065	0.263	0.116	0.236	0.165
	Hyperactivity/Inattention	0.585	0.000*	0.548	0.000*	0.590	0.000*
	Total behavioral problems	0.585	0.000*	0.548	0.000*	0.590	0.000*
<i>Caregivers/parents</i>	Externalizing	0.618	0.000*	0.715	0.000*	0.669	0.000*
	Internalizing	0.373	0.021	0.461	0.004*	0.372	0.026
	Bullying	0.455	0.004*	0.540	0.001*	0.417	0.011*
	Hyperactivity/Inattention	0.652	0.000*	0.760	0.000*	0.676	0.000*
	Autism spectrum A	-0.544	0.000*	-0.624	0.000*	-0.622	0.000*
	Autism spectrum B	0.477	0.002*	0.634	0.000*	0.498	0.002*
Total behavioral problems	0.677	0.000*	0.741	0.000*	0.676	0.000*	

*significant correlations; N = 36.

behavioral problems and higher cortisol concentrations than their peers who were free of antecedents of trauma. Besides, in this participants, the cortisol levels were correlated with social skills and behavioral problems. Several studies have reported behavioral problems in children and adolescents posterior to sexual abuse, but our approach analyzed this phenomenon through the views of adolescents and their caregivers. Surprisingly, many coincidences emerged, perhaps suggesting that the girls in our CSA group were aware of their deficiencies in the aforementioned areas.

Regarding social skills, CSAG achieved lower scores on the total social skills index and all its sub-scales. The between-group differences were similar in both the participants' and caregivers/parents' perspectives, except for assertion, engagement and bullying, where no between-group differences appeared on the caregivers/parents' scale. These results indicate that the participants with CSA had a lower ability to interact appropriately and effectively with other people. In other words, they showed less ability to communicate kindly with others in order to promote social interaction, to cooperate and share with others, to follow rules, to show respect for ownership of work and concern and regard for the feelings and viewpoints of others, or to respond appropriately in conflict and non-conflict situations.

On the participants' and caregivers/parents' questionnaires, CSAG had higher scores on the total behavioral problems index and each sub-scale (except in bullying in the first questionnaire). This means that the subjects with CSA are perceived as more verbally and physically aggressive, with failures to control their temperament and a tendency to argue (externalize problems) and be hyperactive, impulsive, easily distracted (hyperactivity/inattention), anxious, sad and lonely. They also have poor self-esteem (internalize problems) and present more problems of bullying. In other words, they may try to force others to do things, hurt people physically or emotionally, and refuse to allow others join in activities. Finally, this group had more autistic behaviors, such as poor interaction, refusing to take part in conversations, avoiding eye contact, making odd gestures, and becoming upset at changes in routine, or developing non-functional routines.

Previous studies have reported that children who have experienced abuse exhibited impaired social behavior, which included fewer friends and social contacts, and more social adjustment problems [43] [44]. Besides, they presented lower levels of interpersonal trust in people surrounding them [44] and have behavioral problems of the externalization and internalization type [45]. Our results agree with earlier reports in which girls with a history of sexual abuse had difficulties in relating adequately to peers and manifested risk behaviors [46]. These behavioral sequelae can be displayed in the long term since some adult women victims of childhood sexual abuse have been found to suffer sexual dysfunction [47] [48] and revictimization [49] [50] with suicidal behavior [51] [52].

In addition to showing symptoms of PTSD, the girls with CSA presented more depression and anxiety symptoms, a common finding in the literature [49]

[53] [54] [55]. These psychopathological disorders and early stress events are all associated with deregulation of the activity of the HPA axis that can induce an increase in basal cortisol release [17]. We found that girls with CSA had higher levels of salivary cortisol compared to those in HCG. Similar results were reported in a meta-analysis by Fogelman & Canli [20] of victims of sexual, physical and emotional abuse.

In CSAG, we also found a negative correlation between the scores on the total social skills scales and salivary cortisol levels, but a positive correlation with the scores for behavioral problems. The last tendency was observed more clearly in the analyses done with the two groups (CSAG and HCG), especially in the morning samples. There are two plausible explanations for these significant correlations. First, the presence of deficits in social skills together with behavioral problems could be related to greater stress and, therefore, increased cortisol secretion [5]; second, cortisol could exert deleterious effects on the nervous system in the regions implicated in social skills and self-regulation.

Excess cortisol could interfere with neural transmission [56] and, under conditions of prolonged exposure, have more long-lasting and distal effects via neuronal death [57], delays in myelination, developmental abnormalities such as neuronal pruning, and inhibition of neurogenesis and gliogenesis or brain growth factors [58]; that is, maladaptive changes that progressively impair brain functions. These harmful effects are evident in brain structures involved in self-regulation and social skills [3] [31]. In this regard, brain imaging studies have found that subjects with a history of abuse present alterations in both the anatomy and functioning of hippocampus [25], amygdala [59], temporal lobes [28], anterior cingulate [29] and prefrontal cortices [30].

In addition to sexual abuse, the girls evaluated in this study suffered other early life stress experiences, such as other forms of maltreatment, and witnessing fights by their parents, etc. They may also have suffered prenatal stress during gestation because many were born into violent, dysfunctional families. This kind of stress can affect babies' future behavior and mental health [60].

The present study evaluated adolescent women in part because it is well-known that many mental health issues begin in early adolescence [61], for this is a developmental stage in which psychopathologies and behavioral problems can develop due to deficiencies in top-down control. Adolescence is also characterized by a relatively faster maturation of sub-cortical affective brain areas, especially the amygdala, compared to the slower maturation of the prefrontal cortex. Chronic early stress induces hyperactivation of the amygdala [27] and a functional-anatomical deterioration of the prefrontal cortex [30], such that traumatic experiences aggravate the weak top-down control typically seen in adolescents. This could explain the lower social skills and more pronounced behavioral problems seen in CSA adolescents.

In addition to the higher basal cortisol levels and their effects on the nervous system, it is important to consider that girls with CSA do not have optimal opportunities to develop social skills. Children learn models of how to relate to

others based on interaction with their parents, and then generalize those models to relations with peers [62]. Most child sexual abuse survivors are raised in milieus with limited opportunities to learn social skills because their relationships with both parents are inadequate [63] [64] and communication between the non-offending mother and her abused son or daughter is generally deficient [65]. These family characteristics were especially noticeable in our sample, since most of these adolescent girls had been repeatedly abused by a close relative (father, stepfather, brother, stepbrother, etc.). Besides, the victim's families used to have a low socioeconomic status, the parents' education level tended to be low, the family structure tended to be problematic (e.g., divorce or death of a parent) and there is domestic violence [64].

In the context of their relationships, maltreated children tend to create negative models of themselves and others that contribute to the difficulties they experience in relating to their peers. Moreover, abusive family practices can generate conditioned fear and anxiety, which can become generalized and result in social avoidance and withdrawal behaviors [66].

Finally, the present study has some limitations related to the impossibility of determining whether the differences between the groups were due to the presence of CSA or to a cumulative effect of early adversities or PTSD symptoms. As mentioned, CSA is often accompanied by other forms of child abuse and environmental stressors. Although the experience of early adversity makes the groups very dissimilar, we tried to reduce the differences by matching participants from both groups in the best possible way, controlling variables such IQ, sex, age, socioeconomic level and the type of school.

Besides, there was difficulty of recruiting a sufficiently large sample due to the strict inclusion criteria, and the lack of reliable information in subjects' institutional files. For CSAG, for example, we were unable to determine the number of episodes of sexual abuse and had no information on participants' gestational development.

We consider that an important goal for future research, then, would be to analyze long-term effects on the social functioning and HPA axis responses of girls with history of CSA. A follow-up study would be advisable in order to ascertain the diverse trajectories of social difficulties in a longer time frame.

5. Conclusion

The girls with CSA history had lower social skills and more behavioral problems than the control group. The basal cortisol levels were correlated with scores on social skills and behavioral problems scales. These findings thus support the notion that chronic early stress causes an abnormal development of social behavior which can be related with an alteration of the HPA axis.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Supplementary Material

Table S1. Internal consistency reliability (α Cronbach) of social skills improvement system rating scales, mean and standard deviation of each scales and sub-scales of the sample of 46 participants.

	Participants			Parents/Care-givers		
	α Cronbach	Mean	SD	α Cronbach	Mean	SD
Social Skills						
Communication	0.799	2.11	3.32	0.793	14.83	2.77
Cooperation	0.819	13.43	4.11	0.804	12.21	7.39
Assertion	0.553	12.02	9.87	0.626	13.48	2.39
Responsibility	0.844	12.88	4.30	0.809	11.4	2.72
Empathy	0.674	11.83	2.62	0.861	11.86	2.81
Engagement	0.727	14.17	3.41	0.677	13.6	2.43
Self-Control	0.852	9.19	4.16	0.842	11.6	2.715
Total Social Skills	0.934	88.24	19.15	0.937	88.98	14.14
Behavioral Problems						
Externalizing	0.842	10.33	6.02	0.932	7.24	6.59
Bullying	0.667	2.55	2.55	0.878	2.43	3.101
Hyperactivity/Inattention	0.830	6.38	4.13	0.866	3.48	3.58
Internalizing	0.836	8.24	5.52	0.861	5.4	4.79
Autism Spectrum A				0.785	16.17	8.142
Autism Spectrum B				0.610	3.98	3.080
Total Behavioral Problems	0.914	23.55	12.95	0.943	17.79	14.38