Utrecht University

Master Psychology, Department of Developmental Psychology

Deficits in the development of nonverbal behaviour and mild depression in adolescence: Predisposition, state, or scar?

Author: Sabijn Louisse (3160645)

Date: 28-06-2010

Supervisor: Dr. Y. van Beek

Second supervisor: Dr. J. J. S. Dubas

Abstract

Introduction. Deficits in gender-specific nonverbal behaviours have been linked to depressive symptoms in adolescence. The present research examines differences between (mildly) depressed and nondepressed adolescents in conversation with nondepressed same-age, same-sex peers. The research is limited to the differences in 'gazing while speaking', 'gazing while listening' and 'smiling'. These behaviours have been examined before, during and after the expression of a depression.

Methods. Firstly, longitudinal three-wave data of never depressed 12-16-year-old adolescents (N = 42) are reported. Secondly, observations of adolescents before and during the expression of a depression (N = 28) are compared to matched controls. Thirdly, observations of adolescents during and after (N = 29) the expression of a depression are compared to matched controls.

Results. Girls behaved more other oriented compared to boys. They gazed more while speaking and while listening and smiled more. Little development was detected. In addition, both depressed boys and girls demonstrated a deviation from gender role expectations in gazing, especially in gazing while listening compared to controls. The deviation was independent of conditions (before-during-after).

Discussion. The deviation can be seen before, during and after the expression of a depression, which is in line with the predisposition theory and the social skills deficits model. The deviation in gender-specific nonverbal behaviour constitutes a possible risk factor for the development of a depression. However, further steps should be made to inquire *how* these deviations can lead to a depression, and especially in females.

Introduction

During midadolescence, i.e. between the age of 13 to 15 years old, there is a substantial increase in the rate of depressed girls compared to depressed boys (Hankin et al., 1988; Petersen, Sarigiani, & Kennedy, 1991; Wichstrøm, 1999). At the age of 16 approximately twice as many females are depressed compared to males (Hankin et al., 1988). These findings are remarkable, since in preadolescence boys are equally or even slightly more likely to be depressed than girls (Hankin et al., 1988; Petersen et al., 1991). The increase in depressive symptoms has been found both in clinical and in normative samples (Hankin et al., 1988). Several theoretical explanations exist, e.g. cognitive (Nolen-Hoeksema & Girgus, 1994; Petersen et al., 1991), developmental (Petersen et al., 1991), biological (Nolen-Hoeksema & Girgus, 1994), ecological (Gutman & Sameroff, 2004), stressfull life events (Petersen et al., 1991) and social explanations (Kupersmidt & Patterson, 1991; Leach, Christensen, Mackinnon, Windsor, & Butterworth, 2008; Nolan, Flynn, & Garber, 2003)

The present research is part of a larger study that investigates a social explanation for the emergence of gender differences in depression in adolescence and the increase in depression in female adolescents.

Numerous studies have been conducted on the association between social relationships and depression (Connoly, Geller, Marton, & Kutcher, 1992; Dalley, Bolocofsky, & Karlin, 1994; Klein, Lewinsohn, & Seeley, 1997; Puig-Antich et al., 1985a; Puig-Antich et al., 1985b). Positive social relationships can function as a buffer against the development of depression, enhance mental health and prevent recurrence (Buhrmester, 1990). Friendships fulfill universal psychological needs, i.e. for companionship and intimacy and friends can offer support when facing challenges (Demir & Özdemir, 2009). Problems in the interpersonal sphere are related to stress, withdrawal and a negative self-image (Bos, Geerts, & Bouhuys, 2002; Kupersmidt & Patterson, 1991; Lefkowitz & Testiny, 1980; Rudolph, Hammen, & Burge, 1994), which in turn are known to be vulnerabilities for the development of depression (Abramson, Metalsky, & Alloy, 1989).

The social skills deficit model (SSDM) describes the interaction between an insufficiency in social skills and depression (Coyne, 1976; Libet & Lewinsohn, 1973; Segrin, 2000). The model suggests that an individual with less optimal social skills composes an unattractive conversational partner and therefore will receive less positive feedback or even rejection, which may lead to a negative self-image, social isolation and depression. In turn, a depression may have a negative influence on social skills. The SSDM has mainly been used to research adults. Little is known about the relationship between insufficient social skills and depression in adolescence. Van Beek et al. (2006) were the first to apply the SSDM to adolescence. The present research builds on the

research of Van Beek et al. (2006).

It is relevant to use the SSDM to study the relationship between an insufficiency in social skills and depression in adolescence, because social relationship (and therefore social skills) are of increasing importance in adolescence: Adolescents spend more time with peers and these contacts replace the family sphere as key influential field (Windle, 1994). Moreover, adolescents are highly receptive to others' opinions about themselves (Elkind, 1978). Secondly, the content of relationships changes. In childhood, friendships are mostly based on shared activities, while in adolescence the main aspect of friendships is intimacy: sharing emotions and thoughts and providing emotional support (Buhrmester, 1990).

The SSDM has also been used to study a possible explanation for the sudden gender difference in depression in adolescence (Van Beek et al., 2006). The impact of rejection may be different for boys and girls with regard to the development of a depression (Kupersmidt & Patterson, 1991; Reinherz et al., 2000). Low peer acceptance has been noted as a risk factor for the development of depression in both genders (Kupersmidt & Patterson, 1991; Reinherz et al., 2000), while peer problems at age nine (Reinherz et al., 2000), a lack of same-aged school friendships and neglect (Kupersmidt & Patterson, 1991) have been found to be riskfactors for females only.

In puberty sex differences in both the importance and content of friendships emerge (Windle 1994). Girls attach more value to relationships, compared to boys (Gutman & Sameroff, 2004). In addition, female relationships are characterized by a higher need for intimacy and more sensitivity for the opinion of others (Rudolph, 2002), while competition, agression and opposition are more common in relationships between males (Windle, 1994). As a result, other aspects of social skills are needed in women relative to men. All these processes are at stake in puberty and can be included in the social skills deficit model to explore a deviation in the development of social skills as a possible vulnerability for the development of depression, and particularly in girls.

Other oriented nonverbal behaviour

"Because of the general increase in depression during adolescence and the reversal of gender differences the present study was designed to specifically focus on social skills that are gender and/or age specific, or that show a gender- or age-specific link with depressive symptoms" (Van Beek et al., 2006, p. 1273). There is a gender-specific development visible in nonverbal behaviours in adolescence (Van Beek et al., 2006). Nonverbal behaviours express internal states, for instance emotions and traits (DePaulo, 1992). Secondly, nonverbal behaviours convey social information with regard to interpersonal relationships, including intimacy (Dovidio, Brown, Heltman, Ellyson, & Keating, 1988; Lakin, Jefferis, Cheng, & Chartrand, 2003). As a consequence, nonverbal

behaviours are very important in the formation of friendships (Buhrmester, 1990; Lakin et al., 2003). In particular, they are important for female relationships, since friendships between women are defined by a higher need for intimacy (Rudolph, 2002).

Children learn to regulate their nonverbal behaviour according to gender specific display rules, e.g. according to social conventions on how males and females should behave (Saarni, 1979). Gender differences in the displayal of nonverbal behaviours have genetic roots (Golombok & Hines, 2004). Furthermore, they are strengthened by social processes, such as socialization and gendersegregation (Maccoby, 1988; Polivy et al., 2006).

In adolescence boys and girls are increasingly pressured by both parents (Block, 1979) and peers (Gove & Herb, 1974) to assume sex role demands. Boys are encouraged to be independent and to pursue powerful careers and goals (Gove & Herb, 1974). They receive more negative consequences for expessing sadness and pain compared to girls (Zeman & Garber, 1996). Girls are encouraged to submit to others needs and to narrow their aspirations (Nolen-Hoeksema, 1994). They receive more support for the expression of emotions and helpseeking compared to boys (Zeman & Garber, 1996). Research has indicated that not assuming sex role demands will lead to rejection and consitutes a risk factor for emotional health (Gove & Herb, 1974).

As a result of gender specific display rules women demonstrate noticeably more 'other oriented behaviour' compared to men (DePaulo, 1992). Other oriented behaviour can be defined as acting sociable and attentive towards others and is considered to be distinctive feminine behaviour, i.e. conform the female gender role (DePaulo, 1992; Stier & Hall, 1984). Women show more expressive faces, they smile more, they gaze at their communication partners more and are gazed at more. They approach others more closely and are approached more closely, they have more physical body contact and their body movements are more involved (Stier & Hall, 1984).

Other oriented behaviours are still developing in adolescence. Girls increase the amount of other oriented behaviours, while boys demonstrate an equal level or even decrease the displayal of these behaviours during adolescence (Van Beek, Van Dolderen, & Dubas, 2006). Given the increased importance of obliging to gender role expectations and other oriented behaviours being distinctive feminine behaviour, the main focus of the current study is placed on the possible role of other oriented behaviours in the development of a depression in adolescence. Other oriented behaviours can be included in the social skills deficits model to examine if a deviation in this behaviour leads to rejection and eventually to the development of a depression.

The concept of other oriented behaviour is rather extensive, hence exceeding the reach of the current research. Therefore, the present research focuses on the other oriented behaviours 'gazing' and 'smiling'. Other student researchers are simultaniously

studying the same dataset and investigate the other oriented behaviours 'backchanneling' and 'positive emotional responsivity' (Andringa, 2010; Bouwman, 2010).

Other oriented nonverbal behaviours 'gazing' and 'smiling'

'Gazing' is a sign of a willingness to become involved with one another or to strengthen an existing relationship (Cherulnik, Neely, Flanagan, & Zachau, 1978). Overall, research has demonstrated adult females to gaze more compared to males (Hall, 1984). A differentiation between 'gazing while listening' and 'gazing while speaking' is made. 'Gazing while listening' is an indication of positive interest for the conversational partner. Adult females gaze more while listening compared to adult males (Dovidio, Keating, Heltman, Ellyson, & Brown, 1988). 'Gazing while speaking' is related to enthusiasm, dominance and confidence when high and anxiety when low (Farabee, Holcom, Ramsey, & Cole, 1993).

Adult males and females display equal levels of gazing while speaking (Dovidio, Keating et al., 1988). The visual dominance ratio has been developed to summarize visual dominance behaviour (Exline, Ellyson, & Long, 1975). The ratio consists of the percentage of gazing while speaking relative to the percentage of gazing while listening. In the current society men, as a group, are considered to have more status in life compared to women (Berger, Rosenholtz, & Zelditch, 1972). Observational research has revealed that men display comparable levels of gazing while speaking and gazing while listening, resulting in a relatively high visual dominance ratio. Women gaze more while listening than while speaking, resulting in a comparatively low visual dominance ratio (Dovidio, Keating et al., 1988). The same pattern has been found with regard to the visual dominance ratio in adolescents (Van Beek et al., 2006). However, female adolescents displayed higher percentages of gazing while speaking compared to males (Van Beek et al., 2006).

Gender differences have also been found in 'smiling'. Smiles are important interpersonal cues. Smiling is a sign of hapiness and positive interest. Smiles can evoke positive emotional responses and more favorable attittudes in conversational partners (Sullivan & Masters, 1988). Smiling is distinctive feminine behaviour. A sex difference in smiling has been noted in laboratory settings (Dovidio, Brown et al., 1988), in naturalistic settings and even in depictions of men and women in advertisements (Halberstadt & Saitta, 1987). That is to say, women smile more compared to men (Halberstadt & Saitta, 1987). The same pattern has been found in male and female adolescents (Van Beek et al., 2006).

Little is known about the development of other oriented behaviours in adolescence. Van Beek et al. (2006) conducted a crosssectional comparison of other

oriented behaviours, including the behaviours 'gazing' and 'smiling', between 13-years-old and 16-years-old. The study concluded that adolescent girls smile more and display more gazing while speaking and more gazing while listening compared to boys. In addition, older girls smile and gaze more while speaking and while listening, compared to younger ones, whereas older boys demonstrated slighly less of these behaviours compard to younger ones (Van Beek et al., 2006). The research of Van Beek et al. (2006) is crosssectional and inherently only compares different age groups. Further research is needed to examine the development of other oriented behaviours in adolescence longitudinally.

The first aim of this study is to partially replicate the research of Van Beek et al. (2006) with the use of a longitudinal dataset (three waves, nine months interval).

The second aim of this study is to examine the relationship between a deviation in other oriented nonverbal behaviour and (mild) depression in adolescence.

Deviations in 'gazing' and 'smiling' and depression

There are several indications that depressed individuals display deficits in gazing and smiling. Depressed adults engage in less eyecontact with others (Dow & Craighead, 1987; Segrin, 1992) - in particulair they are less likely than controls to be gazing while speaking (Rutter & Stephenson, 1972) - and they smile less compared to nondepressed individuals (see review by Segrin, 2000). Overall, depressed adults produce approximately one-half of the actions in social situations compared to nondepressed adults (Libet & Lewinsohn, 1973).

In contrast to the wealth of studies on nonverbal deficits and depression in adulthood, little is known about children. A single study indicated that depressed children (ages 7 to 12 years) demonstrate less smiling and less eyecontact compared to nondepressed children (Kazdin, Sherick, Esveldt-Dawson, & Rancurello, 1985). Only one study has been conducted on deficits in genderspecific nonverbal behaviour in adolescence: the study of Van Beek et al. (2006). This study demonstrated that mildly depressed female adolescents (age groups 13 and 16) gaze less while listening and while speaking in peer-peer interactions, whereas no differences between mildly depressed and nondepressed males were found. In addition, there are indications that depressed adolescents from both sexes smile less compared to controls in peer-peer interactions, although this finding just missed significance (Van Beek et al., 2006).

Excluding the research of Van Beek et al. (2006), none of the described readings controlled for gender differences. Consequently, these studies can not be used to explain the sudden gender difference in depression (Hankin et al., 1988; Petersen et al., 1991; Wichstrøm, 1999). In addition, the studies examined covariation, i.e. they were executed while the participants were already (mildly) depressed, or were crosssectional, i.e. they

examined group differences between (mildly) depressed and nondepressed individuals. The question remains whether a deviation in genderspecific nonverbal behaviour is a predisposition, state or scar with regard to the development of mild depression.

State, scar and predisposition theory

Three theories are discussed below to explain the relationship between social skills and depression: the state theory, the scar hypothesis and the predisposition theory.

According to the *state theory* a depression merely affects individuals while being presently depressed. A wealth of research has demonstrated the association between depression and a wide array of deficitis in social skills (Segrin, 2000).

According to the *scar hypothesis* symptoms of a depression have not only immediate implications for present social skills but alsof for the future production of social behaviour (Sobin & Sackeim, 1997). Individuals develop certain characteristics throughout a depression. These characteristics remain, even when the depression has been resolved and enhance the risk to relapse (Lewinsohn, Steinmetz, Larson, & Franklin, 1981). Retrospective studies have demonstrated that low social support of familiy (Lewinsohn et al., 1994), a pessimistic attribution style (Nolen-Hoeksema, Girgus, & Seligman, 1992), internalizing behaviour, stressfull life events and excessive emotional dependence (Rohde, Lewinsohn, & Seeley, 1994) are possible 'scars' that remain in adults after a depression has been resolved.

Only one study critically examined the scar hypothesis (Beevers, Stice, Rohde, & Nolen-Hoeksema, 2007). This study focused on female adolescents with no prior history of psychopathology who developed a depression and recovered during the study. All participants repeatedly completed questionnaires on thirteen characteristics, which are known to be associated to depression. Three questionnaires were included to measure social aspects: parental and peer support, social adjustment and antisocial behaviour. None of these characteristics developed solely during or after the expression of depressive symptoms. The depressed individuals already displayed a deviation in the characteristics before the expression of a depression, when compared to neverdepressed controls. The deviation became more pronounced during the expression of a depression and returned to baseline after the depression declined, but remained high in comparison to the baseline of nondepressed individuals (Beevers et al., 2007). Thus, the results provided little support for the scar hypothesis and in stead suggested that risk variables are elevated both before, during and after the expression of a depression.

There are some limitations to the study. Firstly, the sample of Beevers et al. (2007) consisted solely of adolescent *girls*. Therefore the findings cannot be generalized to adolescent boys. Secondly, this study design has never been used for the investigation of in vivo behaviour, since it relied on questionnaires. Thirdly, Beevers et al. (2007) have

not matched their experimental and control group based on their baseline depressive symptomatology, i.e. while being nondepressed both before and after the expression of a depression. The participants who turned depressed during the study may have allready demonstrated an elevated level of depressive symptomatology before the actual experience of the mood disorder. An elevation in depressive symptomatology can have influenced the characteristics associated to depression even before and after the expression of a depression.

According to the *predispostion theory* poor social skills are antecedents to the experience of depression, as described by the SSDM. Individuals with poor social skills cannot obtain helpful support from the environment and as a consequence lack the buffer to prevent negative events (Segrin & Abramson, 1994). A wide array of social skills have been studied, both with the use of questionnaire and observational studies (Hokanson, Rubert, Welker, Hollander, & Hedeen, 1989; Lewinsohn, Hoberman, & Rosenbaum, 1988; Lewinsohn et al., 1994; Segrin, 1993, 1996, 1999; Wierzbicki, 1984; Wierzbicki & McCabe, 1988). The results are mixed. A possible explanation for the incompetencies in defining deficits in social skills as predictors of future depression can be attributed to the random inclusion of these skills in the studies. Apparently, no framework has been used to guide the selection. In addition, most studies did not control for the effects of gender. Since numerous (nonverbal) social skills are gendertypical (Van Beek et al., 2006) deviations can have remained unnoticed. The present study is guided by the construct of the gendertypical development of nonverbal behaviours in adolescence and determinedly considers gender differences.

Aims of the study

The first aim of the study is to replicate the research of Van Beek et al. (2006) now longitudinal data have been collected. With the use of a longitudinal dataset (three waves, nine months interval) the gender-specific developmental pattern in the displayal of other oriented behaviours and individual differences in this developmental outline can be examined. The included participants ($N = 42$) demonstrated no prior history of psychopathology and scored "nondepressed" on all the measurements.

The following hypotheses are based on the research of Van Beek et al. (2006). Firstly, girls are expected to smile more and gaze more, especially while listening compared to boys. In addition, girls are expected to demonstrate a significantly lower visual dominance ratio compared to boys, i.e. gazing more while listening relative to gazing while speaking. On the other hand boys are expected to demonstrate a fairly equal level of gazing while speaking and gazing while listening. Secondly, the differences between boys and girls are expected to increase during adolescence. Older girls are expected to gaze and smile more in comparision to younger girls, whilst older boys are

expected to gaze and smile less compared to younger ones. Thirdly, the developmental pattern of gazing and smiling is expected to be dependent on the age of the participants at the start of the research. Most of the sex specific development in other oriented behaviours is expected to occur between the ages of 13 to 16 years old.

The second aim of the study is to examine the relationship between a deviation in other oriented nonverbal behaviour and (mild) depression in adolescence. This study researches if there is a difference in the development of the genderspecific nonverbal behaviours 'gazing while speaking', 'gazing while listening' and 'smiling' between adolescents who became mildy depressed during the study (or already were at the first wave) and a never depressed control group. Two selections of adolescents were compared to matched controls: adolescents who have been observed before and during the expression of a depression (N = 28) and adolescents who have been observed during and after the expression of a depression (N = 29).

The following hypotheses are based on the leading theory behind the present study, i.e. that depressed adolescents demonstrate deviations from gender specific display rules (Van Beek et al., 2006). Firstly, depressed girls are expected to demonstrate a lower frequency of smiling and less gazing, especially while listening, compared to never depressed controls while controling for the effects of age. Moreover, depressed boys are expected to smile and gaze more compared to never depressed controls while controling for the effects of age. Finally, the individuals who became mildly depressed during the study are expected to display a deviation in smiling and gazing before, during and after the expression of a depression, when compared to never depressed controls. This is in line with the predisposition theory (Segrin & Abramson, 1994) and with the research of Beevers et al. (2007). A deviation in smiling and gazing is estimated to become more pronounced during the expression of a depression and return to baseline after the depression declines, but to remain high in comparison to the baseline of nondepressed individuals. The increased deviation during the expression of a depression is in line with the state theory (Segrin, 2000). After the depression has been resolved, the deviations in smiling and gazing are expected to decline which is incompatible with the scar hypothesis.

Methods

Participants

Participants were ninety-one adolescents (41 boys) selected from a larger sample (N = 445) of Dutch students. The participants stemm from the first to the fourth class of two secondary schools located in the cities Gouda and Voorburg, in the western part of the Netherlands. The total group had a mean age of 14.5 years at the start of the study (age range:12-16 years, SD = 1.02).

Design

Longitudinal data have been collected during a period of 2.5 years. Roughly every nine months a CDI score and videorecords of peer-peer conversations have been collected. The selected adolescents can be devided in two groups: a (mildly) depressed group and a nondepressed group.

Nondepressed group. Adolescents (N = 42, 20 males), with no prior history of psychopathology, a mean age of 14.5 (age range:12-16 years, SD = 1.12) and a CDI-score below the mildly-depressed treshhold (a cut-off score of ≤10) on a Dutch version of the Children's Depression Inventory (Leuven & Van Beek, 2000) were included in the nondepressed group. The selected participants completed three or more measurements, whereas twenty-six participants even finished four measurements (see Appendix D on the constitution of the 'three measurements group'). Since the three-measurements-group is larger and therefore has more statistical power, the results of the three measurements group are reported. See Table 1 for an overview of the selected participants. As can be seen from Table 1, the adolescents in the never depressed group demonstrated a relatively low mean score on the CDI (M_{age} = 3.86, SD = 1.98).

Table 1 Nondepressed group by sex, age and mean CDI scores.

Participants		N =	Mean age	SD age	Mean CDI	SD CDI
Class 1	Boy	4	13.15	.20	4.13	1.60
	Girl	4	12.88	.59	2.00	.353
Class 2	Boy	6	13.98	.52	3.44	1.87
	Girl	6	13.96	.75	4.00	1.94
Class 3	Boy	5	14.96	.65	4.93	1.92
	Girl	7	15.09	.30	4.79	1.64
Class 4	Boy	5	15.65	.40	4.27	1.92
	Girl	5	16.00	.49	2.67	3.00
Total boys		20	14.48	1.03	4.16	1.79
Total girls		22	14.59	1.22	3.58	2.15
Total		42	14.54	1.12	3.86	1.98

(Mildly) depressed group. The (mildly) depressed group (*N* = 46) consisted of twenty boys and twenty-six girls, with a mean age of 14.6 (age range:13-16 years, *SD* = .96). The participants in this group were selected based on the following criteria: no prior history of psychopathology, during one or more of the measurements mildly-depressed: a score of >10[1] (i.e., ≥ P75) and during one or more of the measurements nondepressed (≤10). Out of forty-six participants, only eleven adolescents demonstrated the sought after pattern (before-during-after): they were not depressed at the first wave, turned depressed during consecutive waves and returned to a nondepressed level in one of the last waves. Since a groupsize of eleven is to small to conduct quantitative research, two larger selections of depressed adolescents were made: adolescents who were not depressed at the first wave and turned depressed during consecutive waves (before-during group, *N* = 28) and adolescents who were depressed at one of the first waves and turned nondepressed in following waves (during-after group, *N* = 29). The two selections (before-during and during-after) were matched to nondepressed controls, with no prior history of psychopathology, a mean age of 14.6 (age range:12-16 years, *SD* = .96) and during all the measurements a nondepressed CDI-score. Some of the controls (*N* = 7) were suitable as matches for more than one of the adolescents in the (mildly) depressed group and hence were used twice or three times as a control, resulting in thirty-six controls (18 males). The matching was based on age and gender. In addition, in order to minimize group differences in baseline depressive symptoms and the subsequent influence on nonverbal behaviours, the (mildly) depressed group and controls were matched based on their mean CDI-score while nondepressed. At maximum, a three-point-difference was allowed. Thirdly, to facilitate within participant differences in behaviour due to differences in depressive symptomatology, participants were only included in the (mildly) depressed group when a criterium of at least five CDI-points between a mildly depressed score and a nondepressed score had been met. See Table 2 for an overview of the selected participants. As can be seen the mean CDI-score of the during group was relatively high (*M* = 18.31, *SD* =7.88). Upon investigation it appeared that 69.6% of the participants had met the criteria for a mild-depression, whereas 30.4% had scores in the clinical range (>19 = 'clinical' level according to Kovačs, 1992).

Table 2 Before-during and during-after selection and matched controls by sex, age and CDI scores.

Participants		N =	Sex (m/f)	Mean age	SD age	CDI (a)	SD CDI(a)	CDI (b)	SD CDI(b)
(a) - (b)	Ctrl.	28	(11/17)	14.82	1.14	5.05	2.45	4.72	2.31
before - during	Exp.	28	(11/17)	14.65	.93	5.34	2.54	18.31	7.88
(a) - (b)	Ctrl.	29	(14/15)	15.32	1.08	4.73	2.27	4.66	2.12
during - after	Exp.	29	(14/15)	15.27	1.11	17.66	6.15	4.30	2.43

Procedures

Depression inventory. A Dutch version (Leuven & Van Beek, 2000) of the Children's Depression Inventory (Kovačs, 1992) was used to measure depressive symptoms, *see* Appendix A. The questionnaire is suitable for children in the age of 8 to 18 years old. The original Children's Depression Inventory consisted of 27 items. One item from the original CDI concerning suicide was deleted and replaced by two less precarious questions concerning thoughts about death. Previously, the reliability of this revision of the CDI has been demonstrated to be good (Cronbach's alpha = .81) (Van Beek et al., 2006).

The questionnaire encloses 28 forced-choice items such as:

I am sad ones in a while ("Ik voel me af en toe verdrietig") (score 0)

I am sad many times ("Ik voel me vaak verdrietig") (score 1)

I am sad all the time ("Ik voel me de hele tijd verdrietig") (score 2)

Conversations. The exchanges were videotaped for at least five minutes in an empty (class) room. Partners were seated in chairs, placed in an angle of 90 degrees. Partners were same-age, same-sex peers. The partner was not a good friend, to avoid large differences in nonverbal behaviour caused by differences in quality of relationships. It is likely that individuals will be negatively affected by the behaviour of a (mildly) depressed conversational partner (Burgoon, 1994). Hence, all conversational partners were selected to be nondepressed. During the conversation, a conversationleader monitored the flow and duration of the dialogue. Dyads were instructed to discuss a social dilemma concerning relationships with peers until they agreed on the best solution. If participants finished the discussion before five minutes elapsed, they were asked to try to agree upon a top-5/top-10 ranking on various issues until five minutes of conversation occurred. Participants were unaware of the importance of their nonverbal behaviours. They were informed that videotapes were made to preserve the conversation.

Observations. Coding was done by two students. While decoding the behaviours the observers were unaware of the depression score of the participants. The following behaviours were observed by means of real-time decoding of ongoing behaviour with the programme 'Observer 9.0': gazing, i.e., onset and duration of eyes directed towards the

inner part of the face of the partner, speaking, i.e., the onset and duration of speech and smiling, i.e., the frequency of smiling per minute (see Appendix B for a more detailed coding instruction).

Variables. The aforementioned observed behaviours were transformed into four variables: the percentage of gazing while speaking, the percentage of gazing while listening, the dominance ratio, i.e. the percentage of gazing while speaking devided by the percentage of gazing while listening and the frequency of smiling per minute.

Exploring data. The present study involved four groups: a never depressed group and a before, during and after group including matched controls. The normality of distribution has been tested for each group seperately, see Appendix C. All variables were normally distributed across experimental groups, save for the dominance ratio in the control group in the first, $D(42) = .25$, $p < .00$ and third measurement, $D(42) = .25$, $p < .00$ and smiling during and after the expression of a depression in the matched controls. However, smiling has been previously demonstrated to be normally distributed according to research of Van Beek et al. (2006). Nonetheless, for these variables analyses of variances are used and controlled ad hoc with non parametric tests.

Reliability. Interobserver reliability (k; Cohen, 1968) was tested by double-coding ten recordings with a previous measurement. Ater training, the mean agreement was above 85% for all behaviours and Cohen's Kappa were all > .70.

Results

Normal development

To investigate the normal, longitudinal development of 'gazing while speaking', 'gazing while listening' and 'smiling' in adolescence (N = 42), for each of these behaviours repeated-measures designs were conducted with measurement (three waves) as the within factor, gender (boy-girl) as a between subjects variable and age at first wave as a covariate.

Gazing while speaking. There was no main effect of measurement on gazing while speaking, i.e. across measurements adolescents displayed similar percentages of gazing while speaking. Secondly, there was a significant main effect of gender on gazing while speaking, $F(1,39)$= 6.78, p < .01. Girls gazed more while speaking compared to boys. There was no interaction effect of measurement and gender, i.e. the similarities in percentages of gazing while speaking across measurements were independent of gender differences, see Table 3. Thirdly, there was no main effect of the covariate age at first wave on gazing while speaking, i.e. adolescents of all ages displayed similar percentages of gazing while speaking. There was no interaction effect between age at first wave and gender nor between age at first wave and measurement, i.e. the absence of age differences in gazing while speaking was independent of gender differences and the influence of measurements.

Gazing while listening. There was no main effect of measurement on gazing while listening i.e. across measurements adolescents displayed similar percentages of gazing while listening. Secondly, there was a highly significant main effect of gender on gazing while listening, $F(1,39)$= 30.67, p < .001. Girls gazed more while listening compared to boys. There was no interaction effect between measurement and gender, i.e. the similarities in percentages of gazing while listening across measurements were independent of gender differences, see Table 3. Thirdly, there was no main effect of age at first wave on gazing while listening. However, there was a borderline-significant interaction effect of gender and age on gazing while listening, $F(1,38)$ = 3.28, P = .08. The covariate age at first wave was invertedly related to the displayal of gazing while listening in boys, r = -.39, p (one tailed) < .05, i.e*.* older boys gazed less while listening compared to younger boys. On the other hand, age was not significantly related to gazing while listening in girls, i.e. girls of all ages displayed similar percentages of gazing while listening, r = .16, *n.s*. Moreover, there was no interaction effect between measurement and age at first wave, i.e. the similarities in percentages of gazing while listening across measurements were independent of age at first wave. Finally, there was a highly significant main effect of gender on the dominance ratio (gazing while speaking divided by gazing while listening), $F(1,38)$= 11.07, p < .01. Boys demonstrated a higher dominance ratio (M = 1.20, SD = .09) compared to girls (M = .80, SD = .08).[2]

Smiling. There was a significant main effect of measurement on smiling, $F(2,37) = 3.91$, $P = < .05$. The results show that at the third measurement adolescents smiled significantly less compared to the first measurement, $F(2,37) = 3.91$, $p = < .05$, whereas no differences in smiling between the first and second and second and third measurements were found. Additionally, there was a borderline-significant main effect of gender on smiling, $F(1,39) = 3.45$, $p = .07$. There was a trend that girls smiled more compared to boys. There was no interaction effect between measurement and gender, i.e. the pattern of smiling across measurements was independent of gender differences, see Table 3. Thirdly, there was no main effect of the covariate age at first wave on smiling, i.e. adolescents of all ages displayed similar rates of smiling. Finally, there was no interaction effect between age at first wave and gender nor age at first wave and measurement, i.e. the absence of age differences in smiling was independent of gender differences and the influence of measurements.

Table 3 The percentages of gazing while speaking and gazing while listening and the frequency of smiling per minute by measurement and gender.

		M1		M2		M3	
		Mean	SD	Mean	SD	Mean	SD
% Gazing while speaking	Boy	33.5%	20.4%	27.8%	18.4%	21.4%	17.6%
	Girl	38.1%	23.3%	38.8%	13.3%	41.7%	19.3%
	Total	35.9%	21.8%	33.6%	16.7%	32.0%	21.0%
% Gazing while listening	Boy	30.6%	19.4%	24.8%	16.1%	26.4%	20.4%
	Girl	49.1%	18.8%	50.2%	19.4%	56.9%	20.6%
	Total	40.3%	21.1%	38.1%	21.9%	42.4%	25.4%
Freq. smiling/ min.	Boy	2.18	1.14	1.71	1.48	1.42	.91
	Girl	2.44	1.26	2.45	1.04	1.90	1.07
	Total	2.32	1.20	2.10	1.31	1.67	1.02

In summary, there is primarily an effect of gender on gazing while speaking, gazing while listening and smiling. Little development is visible across three measurements, save for a small decrease in smiling. Nonetheless, an interaction between age at first wave and gender did predict an increase in gender differences in gazing while listening, although this finding just missed significance.

Effects of mild depression on nonverbal behaviours

To investigate differences in the development of 'gazing while speaking', 'gazing while listening' and 'smiling' between adolescents who became mildy depressed during the study and never depressed controls, two separate sets of repeated measures designs were conducted for the before versus during selection (N = 56, 28 controls) and the during versus after selection (N = 58, 29 controls). For both selections for each of the variables repeated-measures designs were conducted with condition (before-during or during-after) as the within factor, gender (boy-girl) and experimental group (control-depressed) as between subject variables and age at first wave as a covariate.

Before-during

Gazing while speaking. There was no main effect of experimental group on gazing while speaking, i.e. adolescents in the control and (mildly) depressed group displayed similar percentages of gazing while speaking. Secondly, there was no interaction effect between experimental group and gender nor condition, i.e. the absence of differences in gazing while speaking between experimental groups was independent of gender differences and the influence of conditions, see Table 4.

However, there was a borderline-significant interaction effect of age at first wave and experimental group on gazing while speaking, $F(1,50)= 2.91$, p = .09. In the control group older adolescents displayed a higher rate of gazing while speaking compared to younger adolescents, r = .57, p (one tailed) = < .001, whereas before and during the expression of a depression adolescents in the experimental group displayed similar percentages of gazing while speaking across ages.

Gazing while listening. There was no main effect of experimental group on gazing while listening. However, there was a highly significant interaction effect between experimental group and gender on gazing while listening, $F(1,50)= 7.52$, p = < .01. Both before and during the expression of a depression girls in the experimental group gazed less while listening compared to never depressed controls, whereas boys demonstrated the opposite pattern: they gazed more while listening both before and during the expression of a depression compared to their controls. Finally, there was no interaction effect between experimental group and age at first wave nor between experimental group and condition, i.e. the absence of differences between experimental groups in gazing while listening was independent of age differences and the influence of conditions, see Table 4.

Smiling. There was no main effect of experimental group on smiling, i.e. adolescents in the (mildly) depressed group and never depressed controls displayed similar rates of smiling.[3] There was no interaction effect of experimental group and gender, condition nor age at first wave, i.e. the absence of differences in smiling between experimental groups

was independent of gender differences, the influence of conditions and age at first wave, see Table 4.

Table 4 Percentage of gazing while speaking and gazing while listening and frequency of smiling per minute by experimental group (control-depressed), condition (before-during) and gender (boy-girl).

			Before		During	
			Mean	SD	Mean	SD
% Gazing while speaking	Control	Boy	31.5%	21.2%	21.0%	19.9%
		Girl	40.1%	23.6%	43.1%	23.9%
		Total	36.7%	22.7%	34.4%	24.6%
	Depressed	Boy	34.2%	26.3%	27.2%	26.1%
		Girl	28.2%	13.3%	33.1%	17.6%
		Total	30.5%	19.3%	30.8%	21.1%
% Gazing while listening	Control	Boy	27.1%	19.3%	18.0%	16.0%
		Girl	51.4%	20.2%	58.9%	24.1%
		Total	41.9%	22.9%	42.8%	29.2%
	Depressed	Boy	32.6%	22.9%	31.5%	20.4%
		Girl	37.3%	15.1%	42.0%	16.4%
		Total	35.4%	18.3%	37.9%	18.5%
Fr. smiling/ min.	Control	Boy	1.77	1.03	1.44	.87
		Girl	2.66	1.10	2.17	1.27
		Total	2.31	1.15	1.88	1.17
	Depressed	Boy	2.30	1.04	1.45	.94
		Girl	2.31	1.17	2.53	1.24
		Total	2.31	1.10	2.11	1.23

During-after

Gazing while speaking. There was no main effect of experimental group on gazing while speaking. However, there was a significant interaction effect of experimental group and gender, $F(1,50)= 5.82$, $p = < .05$. During and after the expression of a depression girls in the experimental group gazed less while speaking compared to controls. On the other hand, boys demonstrated the opposite pattern and gazed more while speaking during and after the expression of a depression compared to controls, see Table 5. In addition, there was a significant interaction effect of experimental group and age at first wave on gazing while speaking, $F(1,52)= 7.4$, $p < .01$. Older adolescents in the control group gazed significantly more while speaking compared to younger ones while controlling for the effects of gender, $r = .40$, p (one tailed) $= < .01$. In contrast, adolescents of all ages in the mild depressed group demonstrated similar frequencies of gazing while speaking while controlling for the effects of gender. Finally, there was no interaction effect between experimental group and condition, i.e. the absence of differences in gazing while speaking between experimental groups was independent of conditions.

Gazing while listening. There was no main effect of experimental group on gazing while listening. However, there was a highly significant interaction effect of gender and experimental group on gazing while listening, $F(1,52)= 12.50$, $p < .001$. During and after the expression of a depression girls gazed less while listening compared to controls, whereas depressed boys gazed more while listening compared to controls, see Table 5. Finally, there was no interaction effect between experimental group and condition nor between experimental group and age at first wave on gazing while listening, i.e. the absence of differences in gazing while listening between experimental groups was independent of the influence of conditions and age at first wave.

Smiling. There was no main effect of experimental group on smiling, i.e. adolescents in the (mildly) depressed group and never depressed controls displayed similar rates of smiling.[4] There was no interaction effect of experimental group and gender (see Table 5), condition nor age at first wave, i.e. the absence of differences in smiling between experimental groups was independent of gender differences, the influence of conditions and age at first wave.

In summary, a gender x experimental group effect was found on gazing, especially on gazing while listening. The effect was independent of conditions, i.e. the effect remained stable across the before, during and after condition. In addition, an interaction effect between age at first wave and experimental group was found on gazing while speaking. Older controls gazed more while speaking compared to younger controls, whereas depressed adolescents displayed similar percentages of gazing while speaking across ages.

Table 5 Percentage of gazing while speaking and gazing while listening and frequency of smiling per minute by experimental group (control-depressed), condition (during-after) and gender (boy-girl).

			During		After	
			Mean	SD	Mean	SD
% Gazing while speaking	Control	Boy	25.7%	22.4%	20.7%	17.6%
		Girl	43.1%	22.9%	43.1%	13.6%
		Total	34.7%	23.9%	32.3%	19.1%
	Depressed	Boy	26.0%	19.6%	30.9%	19.1%
		Girl	38.1%	19.0%	35.0%	17.3%
		Total	32.3%	19.9%	34.9%	19.3%
% Gazing while listening	Control	Boy	26.8%	20.2%	20.8%	14.3%
		Girl	56.2%	18.8%	59.7%	19.7%
		Total	42.0%	24.3%	40.9%	26.1%
	Depressed	Boy	34.8%	22.0%	38.1%	24.8%
		Girl	42.2%	14.7%	46.7%	18.5%
		Total	36.7%	17.6%	42.5%	21.8%
Fr. smiling/ min.	Control	Boy	1.22	.98	1.17	.98
		Girl	2.49	1.20	2.05	1.19
		Total	1.88	1.26	1.62	1.17
	Depressed	Boy	1.84	1.20	1.45	1.16
		Girl	2.40	.94	1.85	.82
		Total	2.13	1.09	1.66	1.00

Discussion

The present study investigated whether a deviation in gender specific nonverbal behaviour is preceding, concomitant or consequent to the development of a depression. Firstly, the normal development of the other oriented behaviours 'gazing while speaking', 'gazing while listening' and 'smiling' has been explored and secondly deviations in these behaviours in mildly depressed adolescents compared to controls before, during and after the expression of a depression have been examined.

Normal development

Adolescent girls gazed more while speaking and while listening, demonstrated a relatively low dominance ratio and smiled more compared to boys, though the last finding just missed significance. These findings are in line with the gender-specific pattern found in adolescents in earlier research (Van Beek et al., 2006) and research on adults (Dovidio, Brown et al., 1988; Dovidio, Keating et al., 1988; Halberstadt & Saitta, 1987; Stier & Hall, 1984). Additionally, these results are congruent with gender-specific display rules. Women should behave in a sensitive, more other oriented manner, whereas males are expected to act more dominant in same-sex encounters (De Paulo, 1992; Hall, 1984). Moreover, in males high levels of 'gazing while speaking' may be interpreted as threatening, whereas elevated levels of 'gazing while listening' and 'smiling' may be too intimate (Dovidio & Ellyson, 1982; Exline et al., 1975).

For 'gazing while speaking' no age differences were found between the participants aged 12 to 16, nor longitudinally in the repeated measurements groups. However, there was a trend that gender differences in 'gazing while listening' did increase with age, i.e. older boys demonstrated less 'gazing while listening', whereas girls of all ages demonstrated similar levels of 'gazing while listening'. Nevertheless, 'gazing while listening' remained at a stable level within participants across measurements.

Why is there no longitudinal gender x age effect on 'gazing while listening', whereas crosssectionally age differences have been found? The range of age at first wave reaches approximately four years (12-16-years-old), whereas the three measurements have been gathered in a period of just about two years. Probably, the two-years-period was to short to detect a significant effect of aging.

Finally, for 'smiling' no crosssectional age differences were found. However, longitudinally the frequency of 'smiling' *decreased* in the third compared to the first measurement. Perhaps, aside to the sought after social aspect of 'smiling', a training effect has blurred the results. Conceivable, adolescents became more skilled in resolving the tasks and felt less nervous in consecutive measurements, hence diminishing the

frequency of 'smiling' out of increased attention and decreased nervosity for the undertaking. In addition, it is possible that the results are distorted by observer drift. Perhaps, the observers became more stringent in scoring the frequency of 'smiling'. Intra-observer reliability should be computed to eliminate this possibility. Finally, it is possible that the rate of 'smiling' is more situationally bound compared to 'gazing while speaking' and 'gazing while listening' and was related to the kind of task the adolescents performed. Perhaps, some of the conversational tasks elicited more smiles compared to others. The frequency of 'smiling' across tasks should be investigated to explore this possibility.

Not finding an increase in gender differences in 'gazing while speaking' and finding a cross-gender decrease in the frequency of 'smiling' with consecutive measurements is largely inconsistent with previous research, were older adolescent females smiled and gazed more compared to younger ones and males demonstrated the opposite pattern (Van Beek et al., 2006). However, Van Beek et al. (2006) have studied two age groups with a wider age gap, whereas the present study measured the effect of aging roughly every nine months across a two years period. In addition, in the study of Van Beek et al. (2006) more adolescents aged twelve were included compared to the present study. Possibly, additional significant longitudinal effects of age on 'gazing while speaking' and 'smiling' are obtained when there is a larger difference between the mean ages of the groups, when there is a bigger age range and when group sizes are larger.

Furthermore, calendar age might not be a good indication of maturation in adolescence. Possibly, the 'biological age' of the participants offers a more accurate predictor of development. The biological age can be established by pinpointing the maturational take of of secondary sex characteristics (growth of pubic hair, first period, first ejaculation) and should be included in future research as an alternative predictor for the development of nonverbal behaviour in adolescence. In the present study only a small selection of other oriented behaviours have been studied, i.e. 'gazing while speaking', 'gazing while listening' and 'smiling'. Possibly, more gender and age interactions are visible in additional other oriented behaviour and therefore future research should study further other oriented behaviours and compare findings between conducts.

In summary, gender differences in 'gazing while speaking', 'smiling' and most of all in 'gazing while listening' have been found. However, little development has been detected. A trend was observable between age at first wave and gender, which was largely caused by a diminishing in 'gazing while listening' in boys, i.e. boys continued to behave more manly. Consequently, the present study was unable to establish an accurate developmental outline of gender differences in nonverbal behaviours in adolescence. Secondly, since gender differences in gazing and 'smiling' were allready

present in the research group of the current study it is apparent that the gender-specific development has started earlier in life. Further research should increase the age range and the number of participants to investigate the developmental pattern of these other oriented behaviours and to find out when gender differences first emerge.

The (mildly) depressed group versus controls

Depressed adolescents were expected to display less gendertypical nonverbal behaviour. A gender x depression interaction was found for gazing, in particular for 'gazing while listening'. Girls in the (mildly) depressed group gazed before, during and after the expression of a depression less while listening, compared to nondepressed females. In contrast, boys in the (mildly) depressed group demonstrated the opposite pattern and looked more at their conversational partner while listening across conditions compared to nondepressed males. The same interaction effect has been found for 'gazing while speaking', but only during and after the expression of a depression. No gender x depression interaction effect was found for 'smiling'. These findings are predominantly in line with the theory of Lewinsohn (1974) and Coyne (1976) that depressed individual display less optimal social skills and data of Van Beek et al. (2006).

Moreover, an interaction effect was found between experimental group and age at first wave on 'gazing while speaking'. The effect remained stable across conditions. In the control group older adolescents gazed more while speaking compared to younger ones, whereas no age differences were found in the (mildly) depressed adolescents while controlling for the effects of gender. A possible explanation is that being depressed stops the gender-specific development of other oriented behaviours and removes the usually found age differences in the displayal of other oriented behaviours in adolescence.

The deviations in gender-specific nonverbal behaviour were independent of the before-during-after condition, so these differences are preliminary present, hang about during a depression and remain after adolescents have returned to a nondepressed state. Probably, the deviations are a stable characteristic. A deviation in gender-specific nonverbal behaviour can be a personality trait, genetic-familiair or influenced by the hormonal balance of an individual. In addition, it can be a sign of a more general delay in development and these deviations in nonverbal behaviour can even have biological roots. Further research is needed to inquire the nature of the deviation in 'gazing while speaking' and listening in depressed adolescents. To study these possibilities, further research should include a personality test (for instance the Big-Five), the familiy history of nonverbal communication, hormonal levels and an inquiry of general development.

Finding a deviation before, during and after the expression of a depression is in line with the predisposition theory, that proclaims that a deviation in social skills might be a lifelong predisposing factor for the development of depressive symptoms. People

with good social skills can cope with stressfull life events, whereas poor social skills make people vulnerable for the detrimental effects of stressfull life events (Segrin & Abramson, 1994). At least, this study did not provide evidence for the state theory (Segrin, 2000) nor the scar hypothesis (Sobin & Sackeim, 1997).

Not finding a state effect of depression on social skills is inconsistent with the research of Beevers et al. (2007), in which a deviation in characteristics known to be associated to depression became more pronounced during the expression of a depression and returned to baseline after the depression declined, but remained high in comparison to the baseline of nondepressed individuals.

According to the social skills deficits model a lack of gender-adequate social skills can make depressed adolescents unnatractive conversational partners and causes negative responses from others. Eventually, this leeds to rejection and a negative self image and finally possibly to the development of a depression (Coyne, 1976; Libet & Lewinsohn, 1973; Segrin, 2000). A deviation in other oriented behaviour might be more detrimental to relationships between girls, since these are characterized by a higher need for intimacy (Rudolph, 2002).

Further steps need to be made to investigate if a deviation in the other oriented behaviours 'gazing while speaking' and 'gazing while listening' predicts the development of a depression, and particularly in females. Since a deviation in gender-specific nonverbal behaviour has been noted in both depressed males and females it remains unknown how this could primarily lead to a higher incidence of depression in females. Depressed girls who demonstrate less other oriented behaviour compared to nondepressed girls might not be attractive conversational partners. Likewise, the displayal of girlish, more other oriented behaviour is not expected to be admired in (depressed) boys either. Possibly, girls receive more negative responses when they display a deviation in gender-specific nonverbal behaviour compared to males. To study the likelihood of this option the responses of interactionpartners to male and female depressed individuals should be investigated. In addition, it is possible that the self-image of girls is to a higher degree dependent on social feedback of others, whereas males derive less of their feelings of self-worth out of the opinion of others. Further research should investigate the association between (negative) social feedback and self-image in male and female adolescents. In summary, more research is needed to investigate whether a deficit in gender-specific nonverbal behaviours can predict the sudden increase of depressive symptoms in adolescence, and particularly in females.

General discussion

The study was limited by the original set of 445 adolescents of whom only a small subset developed symptomatology above the mildly depressive treshold. Possible future research should extend the original set of adolescents to ensure a larger (mildly) depressed group. Subsequent, when the group of participants is enlarged, three-way-interactions can be performed more truthfully. There were not enough participants in the present study to reliably conduct three-way-interactions. Three-way-interactions can be interested, since the gender-specific effects of a depression are expected to increase with age at first wave.

In summary, the study demonstrated that both depressed male and female adolescents depart from gender-specific display rules in 'gazing while speaking' and 'gazing while listening'. Perhaps, this departure removes the usually found age differences in the displayal of other oriented behaviours in adolescence. The movement away from normal development was visible before, during and after the development of a depression, which is in line with the social skills deficits model.

In conclusion, this study provided evidence that nonverbal behaviours differ between mildly depressed and nondepressed adolescents of both sexes. Merely finding this divergence suggests that deficits in nonverbal behaviours are not just associated to a a clinical depresion, but also to milder forms of depression. The findings also emphasize the value of gender-specific social development in adolescence. Possibly, when depressed adolescents violate gender-specific display rules this has detrimental effects on the quality of interaction. Perhaps, there are higher requirements for gender-specific nonverbal behaviours in female relationships compared to male relationships and/ or females derive more of their self-worth out of social evaluations compared to males.

Furthermore, the study demonstrated that the differences are noticable before, during and after a depression, which is in line with the predisposition theory. Hence, a deviation in 'gazing while speaking' and 'gazing while listening' constitutes a possibly predictor for the development of depressive symptomatology. Further research should investigate the relationship with other social skills and well known risk factors of depression, such as personality traits and hormonal levels to increase the understanding of the course of a depression. In addition, gender-specific deficits in gazing can increase the vulnerability for, or could act as a moderator or mediator of these other factors. Finally, this study point out to the possible relevance of early intervention programms aimed at increasing social skills in adolescents at risk for the development of a depression. In addition, it might be useful to include deviations in nonverbal behaviour in explanatory theories for the gender-specific development of depression in adolescence.

References

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review, 96*, 358-372.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders, 4th edition, text revision*. Washington, DC: American Psychiatric Association.

Andringa, I. (2010). Unknown. Utrecht University.

Beevers, C. G., Stice, E., Rohde, P., & Nolen-Hoeksema, S. (2007). Recovery from major depressive disorder among female adolescents: A prospective test of the scar hypothesis. *Journal of Consulting and Clinical Psychology, 75*(6), 888-900.

Berger, J., Rosenholtz, S. J., & Zelditch, M., Jr. (1972). Status organizing processes. *Annual Review of Sociology, 6*, 479-508.

Block, J. H. (1979). *Personality development in males and females: The influence of different socialization.* Paper presented at the meeting of the American Psychological Assocation, New York.

Bos, E. H., Geerts, E., & Bouhuys, A. L. (2002). Non-verbal interaction involvement as an indicator of prognosis in remitted depressed subjects. *Psychiatry Research, 113*, 269-277.

Bouwman, M. (2010). Unknown. Utrecht University.

Buhrmester, D. (1990). Intimacy of friendship, interpersonal competence, and adjustment during preadolescence and adolescence. *Child Development, 61*, 1101-1111.

Burgoon, J. K. (1994). Nonverbal signals. In M. L. Knapp & G. R. Miller (Eds.), *Handbook of interpersonal communication* (2nd ed., pp. 344-390). Beverly Hills, CA: Sage Publications.

Cherulnik, P. D., Neely, W. T., Flanagan, M., & Zachau, M. (1978). Social skill and visual interaction. *Journal of Social Psychology, 104*, 263-270.

Connoly, J., Geller, S., Marton, P., & Kutcher, S. (1992). Peer responses to social interaction with depressed children. *Journal of Clinical Child Psychology, 55*, 365-

370.

Coyne, J. C. (1976). Depression and the response of others. *Journal of Abnormal Psychology, 85*, 186-193.

Dalley, M. B., Bolocofsky, D. N., & Karlin, N. J. (1994). Teacher-ratings and self-ratings of social competency in adolescents with low- and high-depressive symptoms. *Journal of Abnormal Child Psychology, 22*, 477-485.

Demir, M., & Özdemir, M. (2009). Friendship, need satisfaction and happiness. *Journal of Happiness Studies, 11*, 243-259.

DePaulo. (1992). Nonverbal behaviour and self-presentation. *Psychological Bulletin, 111*, 200-243.

Dovidio, J. F., Brown, C. E., Heltman, K., Ellyson, S. L., & Keating, C. F. (1988). Power displays between women and men in discussion of gender-linked tasks: A multichannel study. *Journal of Personality and Social Psychology, 55*, 580-587.

Dovidio, J. F., Keating, C. F., Heltman, K., Ellyson, S. L., & Brown, C. E. (1988). The relationship of visual power to visual displays of dominance between men and women. *Journal of Personality and Social Psychology, 54*, 233-242.

Dow, M. G., & Craighead, W. E. (1987). Social inadequacy and depression: Overt behavior and self-evaluation processes. *Journal of Social and Clinical Psychology, 5*(99-113).

Elkind, D. (1978). Understanding the young adolescent. *Adolescence, 49*, 127-134.

Exline, R. V., Ellyson, S. L., & Long, B. (1975). Visual behavior as an aspect of power role relationships. In P. K. Pliner and L. Alloway (Ed.), *Nonverbal communication of aggression*. New York: Plenum Press.

Farabee, D. J., Holcom, M. L., Ramsey, S. L., & Cole, S. G. (1993). Social anxiety and speaker gaze in a persuasive atmosphere. *Journal of Research in Personality, 27*, 365-376.

Field, A. (2009). *Discovering Statistics Using SPSS* (third ed.). London: SAGE Publications Ltd.

Golombok, S., & Hines, M. (2004). Sex differences in social behavior. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development*. Malden:

Blackwell.

Gove, W., & Herb, T. (1974). Stress and mental illness among the young: A comparion of the sexes. *Social Forces, 53*, 256-265.

Gutman, L. M., & Sameroff, A. J. (2004). Continuities in depression from adolescence to young adulthood: Contrasting ecological influences. *Development and Psychopathology, 16*, 967-984.

Halberstadt, A. G., & Saitta, M. B. (1987). Gender, nonverbal behavior, and perceived dominance: A test of the theory. *Journal of Personality and Social Psychology, 53*, 257-272.

Hall, J. A. (1984). *Non-verbal sex differences: Communication accuracy and expressive stule*. Baltimor, MD: The John Hopkins University Press.

Hankin, B. L., Abramson, L. Y., Moffit, T. E., Silva, P. E., McGee, R., & Angell, K. E. (1988). Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology, 107*, 128-140.

Hokanson, J. E., Rubert, M. P., Welker, R. A., Hollander, G. R., & Hedeen, C. (1989). Interpersonal concomitants and antecedents of depression among college students. *Journal of Abnormal Psychology, 98*(209-217).

Izard, C., Huebner, R., Risser, D., McGinnes, G., & Dougherty, L. (1980). The young infant's ability to produce discrete emotional expressions. *Developmental Psychology, 16*(132-140).

Kazdin, A. E., Sherick, R. B., Esveldt-Dawson, K., & Rancurello, M. D. (1985). Nonverbal behavior and childhood depression. *Journal of American Academy of Child Psychiatry, 24*, 303-309.

Klein, D. N., Lewinsohn, P. M., & Seeley, J. R. (1997). Psychosocial characteristics of adolescents with a past history of dysthemic disorder: Comparisons with adolescents with past histories of major depression and non-affective disorders and never mentally ill controls. *Journal of Affective Disorders, 42*, 127-135.

Kovačs, M. (1992). *Children's Depression Inventory, Manual*. New York/Toronto: Multi-Health Systems, inc.

Kuipers, A. (2010). Unknown. University.

Kupersmidt, J. B., & Patterson, C. J. (1991). Childhood peer rejection, aggression, withdrawal, and perceived competence as predictors of self-reported behavior problems in preadolescence. *Journal of Abnormal Child Psychology, 19*, 427-449.

Lakin, J., Jefferis, V., Cheng, C., & Chartrand, T. (2003). The chameleon effect as social glue: Evidence for the evolutionary significance of nonconscious mimicry. *Journal of Nonverbal Behavior 27*(145–162).

Leach, L. S., Christensen, H., Mackinnon, A. J., Windsor, T. D., & Butterworth, P. (2008). Gender differences in depression and anxiety across the adult lifespan: The role of psychosocial mediators. *Social Psychiatry Psychiatric Epidemiol, 43*, 983-998.

Lefkowitz, M. M., & Testiny, E. P. (1980). Assessment of childhood depression. *Journal of Consulting and Clinical Psychology*(48), 43-50.

Leuven, M., & Van Beek, Y. (2000). *Children's Depressive Inventory, Nederlandse Bewerking*. Internal Report, Utrecht, the Netherlands: Utrecht Universityo. Document Number)

Lewinsohn, P. M., Hoberman, H. M., & Rosenbaum, M. (1988). A prospective study of risk factors for unipolar depression. *Journal of Abnormal Psychology 97*, 251-264.

Lewinsohn, P. M., Roberts, R. E., Seeley, J. R., Rohde, P., Gotlib, I. H., & Hops, H. (1994). Adolescent psychopathology: II. Psychosocial risk factors for depression. *Journal of Abnormal Psychology, 103*, 302-315.

Lewinsohn, P. M., Steinmetz, J. L., Larson, D. W., & Franklin, J. (1981). Depression related cognitions: Antecedent or consequence. *Journal of Abnormal Psychology, 90*, 213-219.

Libet, J. M., & Lewinsohn, P. M. (1973). Concept of social skill with special reference to the behavior of depressed persons. *Journal of Consulting and Clinical Psychology, 40*, 304-312.

Maccoby, E. E. (1988). Gender as a social category. *Developmental Psychology, 24*, 755-765.

Nolan, S. A., Flynn, C., & Garber, J. (2003). Prospective relations between rejection and depression in young adolescents. *Journal of Personality and Social Psychology, 85*, 745-755.

Nolen-Hoeksema, S. (1994). An interactive model for the emergence of gender

differences in depression in adolescence. *Journal of Research on Adolescence, 4*, 519-534.

Nolen-Hoeksema, S., & Girgus, J. S. (1994). The emergence of gender differences in depression during adolescence. *Psychological Bulletin, 115*, 424-443.

Nolen-Hoeksema, S., Girgus, J. S., & Seligman, M. E. (1992). Predictors and consequences of childhood depressive symptoms: A 5-year longitudinal study. *Journal of Abnormal Psychology, 101*, 405-422.

Petersen, A. C., Sarigiani, P. A., & Kennedy, R. (1991). Adolescent depression. Why more girls? *Journal of Youth and Adolescence, 20*(247-271).

Polivy, J., Herman, C. P., Mills, J. S., & Wheeler, H. B. (2006). Eating disorders in adolescence. In G. R. Adams & M. D. Berzonsky (Eds.), *Blackwell Handbook of Adolescence*. Malden: Blackwell.

Puig-Antich, J., Lukens, E., Davies, M., Goetz, D., Brennan-Quattrock, J., & Todak, G. (1985a). Psychosocial functioning in prepubertal major depressive disorders: I. Interpersonal relationships during the depressive episode. *Archives of General Psychiatry, 42*, 500-508.

Puig-Antich, J., Lukens, E., Davies, M., Goetz, D., Brennan-Quattrock, J., & Todak, G. (1985b). Psychosocial,functioning in prepubertal major depressive,disorders: II. Interpersonal relationships after,sustained recovery from the affective episode. *Archives of General Psychiatry, 42*, 511-517.

Reinherz, H. Z., Giaconia, R. M., Hauf, A. M., Carmola, B. A., Wasserman, M. S. B. S., & Paradis, A. D. B. A. (2000). General and specific childhood risk factors for depression and drug disorders by early adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 223-231.

Rohde, P., Lewinsohn, P. M., & Seeley, J. R. (1994). Are adolescents changed by an episode of major depression? *Journal of the American Academy of Child & Adolescent Psychiatry, 33*, 1289-1298.

Rudolph, K. D. (2002). Gender differences in emotional responses to interpersonal stress during adolescence. *Journal of Adolescent Health, 30*, 3-13.

Rudolph, K. D., Hammen, C., & Burge, D. (1994). Interpersonal functioning and depressive symptoms in childhood: Addressing the issues of specificity and comorbidity. *Journal of Abnormal Child Psychology, 22*, 355-371.

Rutter, D. R., & Stephenson, G. M. (1972). Visual interaction in a group of schizophrenic and depressive patients. *British Journal of Social and Clinical Psychology, 11*, 57-65.

Saarni, C. (1979). Children's understanding of display rules for expressive behavior. *Developmental Psychology, 15*, 424-429.

Segrin, C. (1992). Specifying the nature of social skill deficits associated with depression. *Human Communication Research, 19*, 89-123.

Segrin, C. (1993). Social skills deficits and psychosocial problems: Antecedent, concomitant, or consequent? *Journal of Social and Clinical Psychology, 12*, 336-353.

Segrin, C. (1996). The relationship between social skills deficits and psychosocial problems: A test of a vulnerability model. *Communication Research, 23*, 425-450.

Segrin, C. (1999). Social skills, stressful life events, and the development of psychosocial problems. *Journal of Social and Clinical Psychology, 18*, 14-34.

Segrin, C. (2000). Social skills deficits associated with depression. *Clinical Psychology Review, 20*, 379-403.

Segrin, C., & Abramson, L. (1994). Negative reactions to depressive behaviors: A communication theories analysis. *Journal of Abnormal Psychology 103*, 655–668.

Sobin, C., & Sackeim, H. A. (1997). Psychomotor symptoms of depression. *American Journal of Psychiatry, 154*, 4-17.

Stier, D., & Hall, J. (1984). Gender differences in touch: An empirical and theoretical review. *Journal of Personality and Social Psychology, 47*, 440-459.

Sullivan, D. G., & Masters, R. D. (1988). "Happy warriors": Leaders' facial displays, viewers' emotions, and political support. *American Journal of Political Science, 32*, 345-368.

Van Beek, Y., Van Dolderen, M. S. M., & Dubas, J. J. S. D. (2006). Gender-specific development of nonverbal behaviours and mild depression in adolescence. *Journal of Child Psychology and Psychiatry, 47*, 1272-1283.

Wichstrøm, L. (1999). The emergence of gender difference in depressed mood during adolescence: The role of intensified gender socialization. *Developmental*

Psychology, 35(1), 232-245.

Wierzbicki, M. (1984). Social skills deficits and subsequent depressed mood in students. *Personality and Social Psychology Bulletin, 10,*, 605-610.

Wierzbicki, M., & McCabe, M. (1988). Social skills and subsequent depressive symptomatology in children. *Journal of Clinical Child Psychology, 3*, 203-208.

Windle, M. (1994). A study of friendship characteristics and problem behaviors among middle adolescents. *Child Development, 65*, 1764-1778.

Zeman, J., & Garber, J. (1996). Display rules for anger, sadness and pain: It depends on who is watching. *Child Development, 67*, 957-973.

Footnotes

[1] The criterion of a CDI-score of ≥ 11 was chosen instead of the more comon cuf-off of ≥13 in order to maximize the group size of the (mildly) depressed group (there were to few participants with scores ≥13). One third (*N* = 15) of the participants in the (mildly) depressed group had scores between 20 and 41 (> 19 = 'clinical' level according to Kovačs, 1992). Deletion of these participants did not change findings in previous research and therefore these participants remained included in the study (Van Beek et al., 2006).

[2] Since smiling was not normally distributed the non-paramteric Kruskal-Wallist test was used to control the effect of experimental group on smiling and confirmed findings: *n.s.*

[3] Since the dominance ratio was not normally distributed the non-parametric Kruskal-Wallis test was used to control the effect of gender on the dominance ratio and confirmed findings, $H(1) = 8.39$, $p < .01$.

[4] Since smiling was not normally distributed the non-parametric Kruskal-Wallis test was used to control the effect of experimental group on smiling and confirmed findings: *n.s.*

Appendix A

CDI Questionnaire

Copyright/ not authorized.

Appendix B

Table 6 Coding instruction

| Behaviour	Description	Coding
Gazing	Onset and duration of eyes directed towards the inner part of the face of the partner. When a participant gazed away for less than a second, this was not recorded.	Gazing Not gazing Unclear
Talking	The onset and duration of speech. Talking is defined as vocal expressions of words and meaningful sounds, such as sounds of approvement, for instance "mmm", "yes", "uhuh". Not talking, is defined as silence. Backchanneling behaviours, without vocalizations, were codes as "not talking". These behaviours are defined as affirmative reactions in a conversation that are stated, without interupting the conversation and without the use of vocalizations. For instance, a headnod. Finally, a silence of more than one second in between two sentences has been coded as "not talking".	Talking Not talking
Smiling	Smiling is defined as a positive facial expression characterized by an upward curving of the corners of the mouth, uplifted eyebrowes and uplifted under-eyelids resulting in wrinkles beneath and next to the eyes, compared to baseline facial expression. Smiling was coded solely while the participant was presently not talking, to avoid mistaking normal mouth movements during talking as smiling. When it was unclear whether a participant was smiling or not, the laugh was not recorded. Instances were coded as "smiling", when they included hearable laughter with or without an upward curving of the corners of the mouth, laughing while showing teeths and laughing without showing teeths, but with a noticable increase in the upward curving of the corners of the mouth compared to baseline facial expressions.	Smiling Not smiling

Appendix C

Tests of normality

Control group. Table 7 contains the results of the normality tests of gazing while speaking, gazing while listening, smiling and the dominance ratio in the control group. Smiling was not normally distributed in the first and second measurement according to the K-S test, though differed not significantly from normality according to the more powerful Shapiro-Wilk test. Both test results were combined, resulting in a normal distribution of smiling in the first and second measurement. In addition, smiling was not normally distributed in the third measurement, $D(42) = .18$, $p < .01$, and the dominance ratio was significantly non-normally distributed in the first, $D(42) = .25$, $p < .00$, and third measurement, $D(42) = .25$, $p < .00$. For smiling in the third measurement, no outliers were detected, see Figure C-1, and the scores seemed fairly normally distributed, see Figure C-2. In addition, skewness and kurtosis values were below 1.0 and therefore the distribution is further considered to be normal. For the dominance ratio histograms and box plots uncovered several outliers and a positively skewed distribution, see Figure C-3 to C-5. Neither transformations nor changing the outliers into one unit above the next highest score in the data set (Field, 2009) reduced the skew and therefore parametric tests are used and findings are controlled ad-hoc with non-parametric tests.
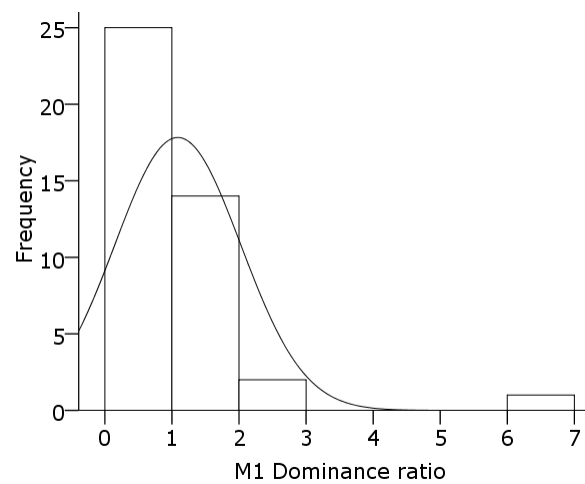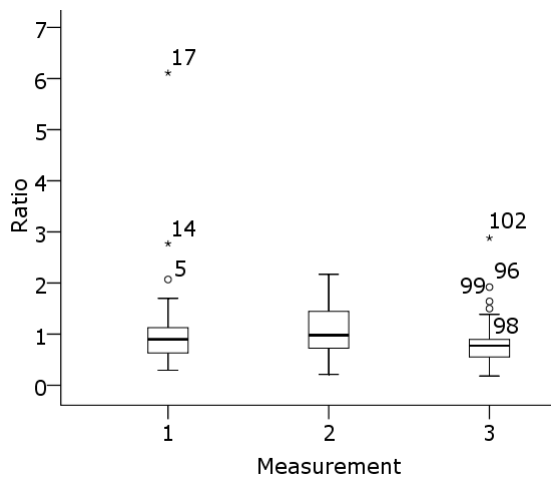
Table 7 Tests of normality (controls)

|	M	Kolmogorov-Smirnov			Shapiro-Wilk		
		Stat.	df	Sig.	Stat.	df	Sig.
Gazing while speaking	1	.11	42	.20	.94	42	.02*
	2	.07	42	.20	.98	42	.59
	3	.10	42	.20	.96	42	.11
Gazing while listening	1	.10	42	.20	.96	42	.13
	2	.10	42	.20	.96	42	.19
	3	.09	42	.20	.96	42	.10
Smiling	1	.16	42	.01*	.95	42	.09
	2	.16	42	.01*	.95	42	.08
	3	.18	42	.00*	.93	42	.01*
Dominance ratio	1	.25	42	.00*	.60	42	.00*
	2	.12	42	.18	.96	42	.14
	3	.25	42	.00*	.78	42	.00*

*Significant at p < .05

Figure C-1 Box plots smiling (controls)   **Figure C-2** Histogram smiling M3 (controls)
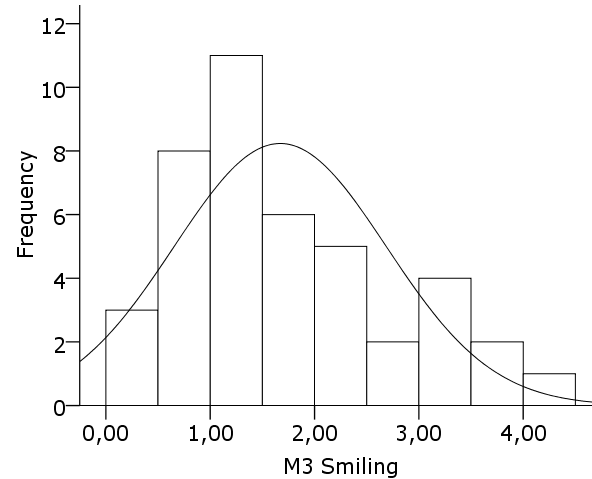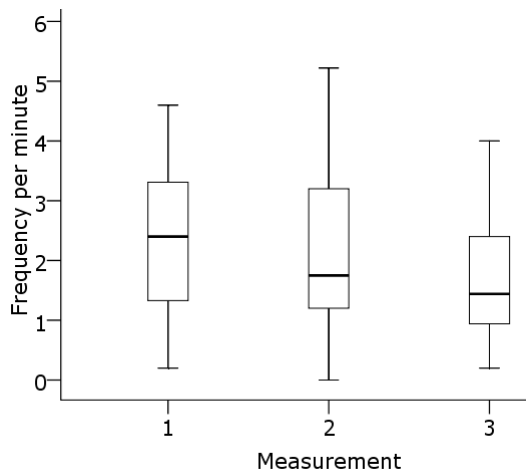
Figure C-3 Box plots domi. (controls)   **Figure C-4** Histogram domi. M1 (controls)

Figure C-5 Histogram domi. M3 (controls)
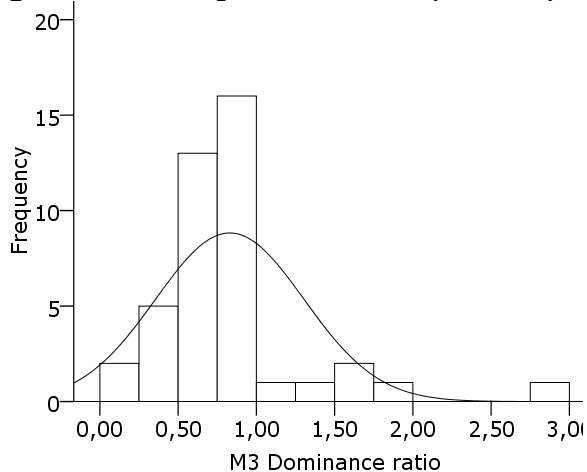
Before group. Table 8 contains the results of the normality tests of gazing while speaking, gazing while listening and smiling in the before group. Since smiling differed not significantly from normality according to the more powerful Shapiro-Wilk test the distribution was considered to be normal in the control group.

Table 8 Tests of normality (before group)

Before group		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Gazing while speaking	Control	.10	28	.20	.95	28	.21
	Depr.	.14	28	.20	.93	28	.05
Gazing while listening	Control	.11	28	.20	.98	28	.73
	Depr.	.13	28	.20	.96	28	.26
Smiling	Control	.18	28	.02*	.96	28	.30
	Depr.	.11	28	.20	.97	28	.68

*Significant at p < .05

During group. Table 9 contains the results of the normality tests of the during group. Since gazing while listening in the depressed group differed not significantly from normality according to the more powerful Shapiro-Wilk test the distribution was considered to be normal. Smiling was not normally distributed in the control group. No outliers were detected, see Figure C-6, and the scores seemed fairly normally distributed, see Figure C-7. In addition, skewness and kurtosis values were below 1.0 and therefore the distribution is further considered to be normal.
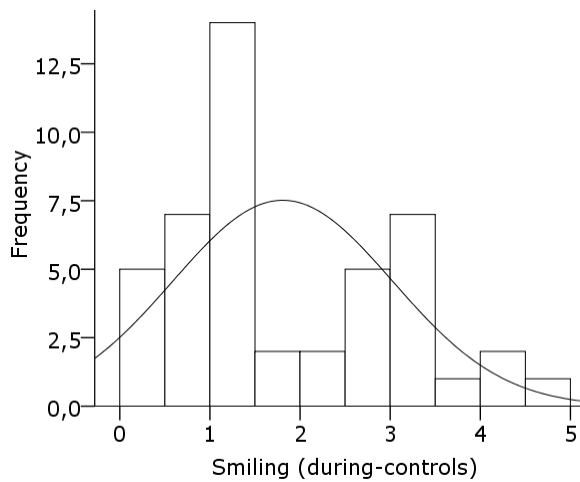
Table 9 Tests of normality (during group)

During group		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Smiling	Control	.19	46	.00*	.92	46	.01*
	Depr.	.08	46	.20	.97	46	.20
Gazing while speaking	Control	.13	46	.05	.93	46	.00*
	Depr.	.10	46	.20	.96	46	.07
Gazing while listening	Control	.13	46	.06	.94	46	.02*
	Depr.	.13	46	.04*	.96	46	.13

*Significant at p < .05

After group. Table 10 contains the results of the normality tests of the after group. Since smiling differed not significantly from normality according to the more powerful Shapiro-Wilk test the distribution was considered to be normal. For smiling in the control group histograms and box plots uncovered several outliers and a positively skewed distribution, see Figure C-8 and C-9. Neither transformations nor changing the outliers reduced the skew and therefore parametric tests are used and findings are controlled ad-hoc with non-parametric tests.

Figure C-6 Box plot smiling (dur.-ctrl.)

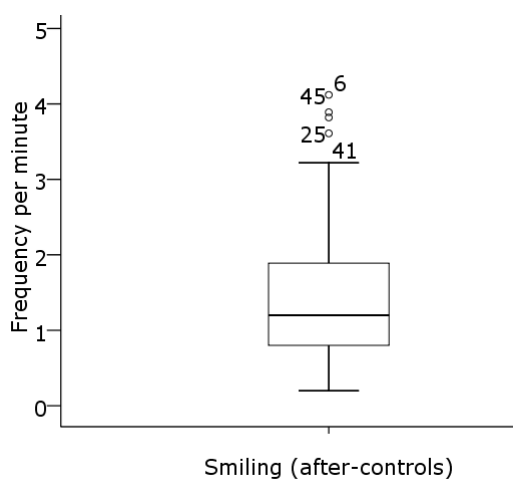**Figure C-7** Histogram smiling (dur.-ctrl.)

**Table 10** Tests of normallity (after group)

		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Gazing while speaking	Control	.15	29	.09	.95	29	.17
	Depr.	.16	29	.06	.90	29	.01*
Gazing while listening	Control	.08	29	.20	.96	29	.26
	Depr.	.12	29	.20	.96	29	.42
Smiling	Control	.19	29	.01*	.85	29	.00*
	Depr.	.17	29	.03*	.95	29	.14

*Significant at $p < .05$

Figure C-8. Box plot smiling (aft.-ctrl.)

Figure C-9. Histogram smiling (aft.-ctrl.)
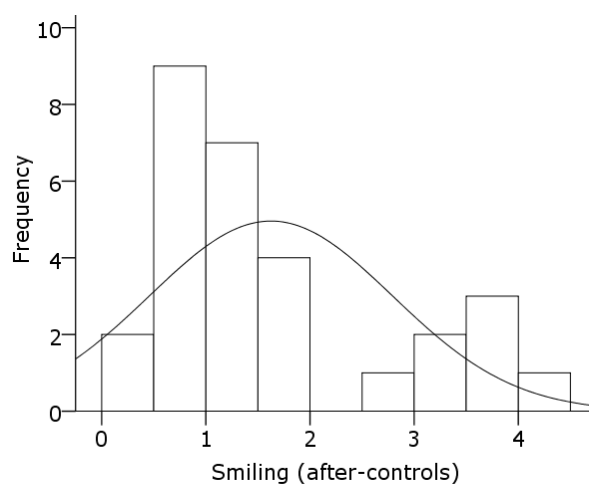
Appendix D

Constitution of the three-measurements-group

The participants (*N* = 42) completed three or more measurements, of whom for six participants there was no data for the first measurement, for two participants there were no data for the second measurement, for three participants there were no data for the third measurement and for five participants there were no data for the fourth measurement. Of the participants who missed the first measurement, the scores for the second, third and fourth measurement were considered to be their first to third measurement. Of the participants who missed the second measurement, the third and fourth measurements were considered to be their second and third measurement. Finally, for the three participants who missed the third measurement, the fourth measurement was considered to be their third measurement. All scores that remained labelled as 'the fourth measurement' were excluded.