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**Reciprocity between family generations in Germany:  
A Within-Person Examination of Longitudinal Data**

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## **Reciprocity between family generations in Germany: A Within-Person Examination of Longitudinal Data**

**Abstract:** Although reciprocity of intergenerational support has been widely considered in family studies, empirical investigations are still rather scarce. This study used data from four waves of the Panel Analysis of Intimate Relationships and Family Dynamics (Pairfam), which inquired the respondents about intergenerational support. We examined whether previously received support from parents is associated with later provision of support to parents. Indicators of intergenerational help were emotional support, practical help, financial aid and personal care. Our analyses used multilevel regression models and investigated both between- and within-person effects. Between-person models indicated mainly positive associations between received and provided support; however, these associations often did not hold in within-person models, which were used to detect individuals' variations over time. According to within-person models, increased emotional support that sons received from a parent was associated with increased financial support to that parent later. Also, increased practical help that daughters received from their fathers was associated with increased financial aid to their fathers later. The magnitude of these positive within-person effects was small compared to the between-person effects; within-person models did not provide any other evidence for causal intergenerational reciprocity.

**Key words:** Reciprocity, support, adult children, parents, Pairfam

## **Introduction**

Support between family generations is a major theme in both sociological- and evolutionary-oriented family studies. A large body of research has concentrated on, for instance, how adult children provide support to their older parents and, respectively, how ageing parents support their adult children and their children's families (e.g., Albertini et al. 2007; Brandt 2013; Szydlik 2016; Tanskanen & Danielsbacka 2018). Due to an ongoing rapid ageing of populations in Western countries, more attention is focused on intergenerational family relations; a central issue concerns responsibilities toward older family members. Prior research has shown that adult children are an important asset for older parents, with some studies suggesting that parents may prepare for old age by investing in their children for the purpose of receiving assistance from them in the future (e.g., Alessie et al. 2014; Izuhara 2010; Friedman et al. 1994; 2008; Geurts et al. 2012).

Although reciprocity has gained increasing attention in family studies, empirical investigations are still rather scarce. Most previous studies examining intergenerational reciprocity are based on cross-sectional data. Results from those investigations show that the more interaction exists between family members, the more support is given and received (e.g., Grundy 2005; Verbrugge & Shannon 2018). Only a few investigations have explored reciprocity between family generations using panel data and they have provided partially mixed results. For instance, while one study found that received emotional support from parents predicted given support to parents later (Geurts et al. 2012), another investigation showed that previously received emotional support from parents was not associated with an increased likelihood of supporting parents later (Evandrou et al. 2018). The mixed findings may result from differences in research subjects, investigated countries and methodological choices. One limitation shared by prior panel studies on intergenerational reciprocity is the lack of within-person models, which enable investigation of an individual's variation over time. In this article, we use the

within-person approach to test whether changes in previously received support from parents is associated with provided support to parents later within an individual's life course.

We use German panel data, which includes multiple variables regarding intergenerational family relationships. An excellent feature of the dataset is that it enables investigations into the association between various forms of received and provided support. In this study, we examine received and provided emotional support, practical help, financial aid and personal care. Germany is an interesting country for investigating kin support, because intergenerational responsibilities are reinforced by law, with individuals having legal obligations towards their adult family members. Parents are expected to provide maintenance for their children until they reach economic independence, and children are obliged to provide financial support to their parents in the case of need, although this obligation is usually called upon only when the payments of care services are at issue (see European e-Justice Portal 2018; Saraceno & Keck 2008; 2010).

### **Theoretical background**

Social exchange theory is a large framework used to investigate the flow of resources between individuals. The concept is rooted in the idea that receiving and providing, that is exchanging, support is a central part of human social interaction, and individuals are assumed motivated by the rewards they expect to gain from exchanges with others (Homans 1958; 1974; Blau 1964). The implicit commitment to informal reciprocity is forced by norms and moral values that drive individuals to return a favour; reciprocating the support they have received from others (Gouldner 1960; Uehara 1995). Although an exchange between individuals may be imbalanced at a given time, the provision of resources is expected to be balanced over time. For instance, parents may provide support for their adult children earlier in their life course to compel future reciprocity at later stages of their lives (Geurts et al. 2012).

In addition to the possible time lag of returning rewards, reciprocity may take place by the exchange of different forms of transfers, meaning various resources valued by the individuals can be used as currencies of exchange (Emerson 1974; Gouldner 1960; Silverstein et al. 2002). Intergenerational interaction typically includes exchange of multiple forms of transfers, such as financial aid, personal care, practical help and emotional support. Hence, reciprocity among family members may not necessarily mean providing and receiving the same form of support, but also exchange of one form to another. For instance, adult children may reciprocate financial aid earlier received from their parents by later providing care to parents (Henretta et al. 1997).

Studies using an evolutionary approach to human relationships emphasise the role of kinship, and especially the degree of relatedness, in the interaction between individuals. The tendency to act more altruistically towards close relatives is explained by the kin selection theory. According to this theory, all other things being equal, investments between individuals should correspond to the degree of genetic relatedness (Hamilton 1964). Kin selection theory is based on the notion that by investing in closely-related relatives, particularly those younger and fertile (Hughes 1988), individuals can enhance their inclusive fitness, that is, the survival of their own genes in the future. For instance, by investing in one's own children, with whom parents share fifty percent of the same genes, individuals can increase the probability of their genes spreading in future generations. Typically, individuals do not consciously attempt to increase their inclusive fitness, rather they follow emotions and cues leading to behaviour beneficial to their inclusive fitness (Trivers 2002). Empirical results from the investigation of the kin selection theory in non-human and human populations during the last five decades has provided extensive support for the theory (e.g., Abbot et al. 2011; Burnstein 2005; Hepper 2011; Pollet & Hoben 2011; Segal & Marelich 2011).

Reciprocity is an essential factor in investments between individuals who are not closely related to each other according to the theory of reciprocal altruism (Trivers 1971), an extension of Hamilton's (1964) kin selection theory. The theory proposes that reciprocity is bound to the development of the human emotional system and commitment to reciprocity is compelled by moral sentiments such as loyalty, gratitude, guilt and remorse (Trivers 1971; 1985). The concepts of social exchange and reciprocal altruism have similarities. However, a remarkable difference between them is the notion of relatedness; according to the evolutionary approach the demand for reciprocity is higher when the degree of relatedness is lower. Empirical studies have indeed shown that the expectation of reciprocity differs between different relationships. For example, friends are expected to reciprocate more than close kin (Rotkirch et al. 2014; Stewart-Williams 2007) and individuals are more willing to make costly sacrifices if the beneficiary is a close relative (Burnstein 2005; Madsen et. al. 2007). Hence, from the evolutionary viewpoint, reciprocity is not expected to play a key role in the provision of intergenerational support between adult children and parents. Instead, all else being equal, individuals should be inclined to invest in the benefit of their inclusive fitness regardless of the reciprocal provision of resources.

### **Prior studies on the reciprocity of intergenerational support**

The provision of support between family generations has been investigated by many studies, most of which have been based on cross-sectional datasets. Investigations of both received and given support have usually demonstrated a positive association between them, that is, those who provide help are more likely to receive support (e.g., Albertini et al. 2007; Brandt 2013). Some studies have interpreted the positive association between provided and received help as evidence for reciprocity of intergenerational support (e.g., Grundy 2005; Verbrugge & Shannon 2018). However, results based on cross-sectional data represent the extent of support exchange at a given time. The positive association

between received support and given help indicates that the more interaction occurs between individuals, the more support is provided both ways.

Previous research has suggested that the positive association between given and received intergenerational support indicates that parents may reward their children for the help they receive from them (Brandt 2013; Brandt et al. 2009). One study (Leopold & Raab 2011) examined this hypothesis further by investigating support exchange within a family, using cross-sectional data from 12 European countries and employing sibling fixed-effect models. The results indicate either that parents provided more financial transfers to those children from whom they received time transfers of help and care, or children who received more financial transfers from parents gave more help to their parents. By using sibling fixed-effect models, the investigation could adjust for unobserved characteristics shared by siblings, for example, family values. However, by relying on cross-sectional data, the study was not informative on the dynamics on reciprocity over time between parents and children.

The core idea of reciprocity lays on the timing of actions: individuals who receive support at a given point in time are assumed to later reciprocate this support. However, only a few empirical studies have investigated exchange of support over time between parents and children. One such study (Silverstein et al. 2002) used six waves of data collected in United States between 1971 and 1997. In this study shared activities were perceived as a proxy for the provision of time resources. According to the results, parents who shared more activities with their children received more social support from the children later in life. Social support to parents included many different forms of support, such as help with transportation, financial aid and emotional support. Additionally, receiving greater financial aid from fathers was found positively associated with social support given to fathers later. Other studies have provided similar results. A Swedish investigation (Lennartson et al. 2010) established that parents who had frequent contact with any of their children earlier were more likely to provide

financial aid to them later compared to parents who had less contact with their children. Moreover, older parents were found to more likely receive help from the children to whom they reported giving financial support in the previous ten years using retrospective data (Henretta et al. 1997).

Using four waves of data collected from The Netherlands, intergenerational reciprocity between parents and their adult children, who had young children of their own, was investigated by another longitudinal study (Geurts et al. 2012). The study examined support older parents received from their adult children, both instrumental and emotional. Instrumental support refers to help with daily chores, such as help with household tasks and providing transportation. Emotional support indicates discussions about personal matters and feelings. The results showed that respondents who had previously more frequently provided childcare for their sons, that is grandparental childcare, received more often instrumental and emotional support from sons approximately 13 years later compared to those respondents who had less frequently provided help with childcare. In contrast, previous investments in daughters did not pay off in terms of increased amount of received support. Additionally, previously provided emotional support from older parents to adult children was associated with later increased amounts of received instrumental and social support from daughters and sons.

A recent British study using two waves of data also found partial evidence for intergenerational reciprocity (Evandrou et al. 2018). Using logistic regression models, the study investigated whether support to parents, such as help with household tasks, transportation and financial aid, was associated with the help that respondents had received earlier from their parents. According to the results, previously received help with accommodation and childcare from parents increased the odds that the children provided support to their parents later. In contrast, previously received financial aid or emotional support from parents did not predict support to parents. Moreover, the study did not find



significant associations between the provision of personal care to parents and any previously received parental support.

Previous research has shown that gender is an important factor in the exchange of support between family generations. Women more than men tend to provide more intergenerational time transfers, especially personal care, although men often provide more financial transfers than women (Albertini et al. 2007; Brandt et al. 2009; Fokkema et al. 2008; Schmid et al. 2012). Intergenerational support is also associated with recipient gender: mothers are given more time transfers than fathers (Brandt et al. 2009; Fokkema et al. 2008) and more help is provided to daughters than sons (Brandt & Deindl 2013; Danielsbacka et al. 2011, 2015; Michalski & Shackelford 2005).

Studies investigating intergenerational reciprocity have examined the effect of gender using varying approaches. Typically, investigations have controlled for a respondents' gender or investigated support in two dyads, which have been based either on the gender of parent or the gender of the child: either parent-daughter and parent-son, or child-mother and child-father. Daughters are notably more likely to provide support to their parents than sons (Evandrou et al. 2018; Henretta et al. 1997) and (grand)parental provision of childcare to sons predicts received support from the sons to parents later (Geurts et al. 2012). Greater amounts of financial transfers from fathers to children are often positively associated with later provision of social support to fathers from children (Silverstein et al. 2002). The results regarding the gender effect on intergenerational relations suggest that the differences in the patterns of intergenerational support can be linked to the gender of both parent and children. Hence, this study examines reciprocity in all four gender dyads (son–mother, son–father, daughter–mother and daughter–father) to gain comprehensive results on intergenerational reciprocity.

## **Data and methods**

This article uses data from the Panel Analysis of Intimate Relationships and Family Dynamics (Pairfam), which offers extensive information on intergenerational relations in Germany (Brüderl et al. 2017; Huinink et al. 2011). Pairfam collects longitudinal data based on nationwide random samples from three birth cohorts: respondents were born in 1991–1993, 1981–1983 and 1971–1973. The first wave of Pairfam was carried out between 2008 and 2009. At that time, cohort individuals were aged approximately 15–17, 25–27 and 35–37. Further data collections have been conducted annually; currently nine waves are available for use by researchers. In this study, we use waves 2, 4, 6 and 8 because only these waves include questions about intergenerational support between the respondents and their parents. The second wave contains 9,069; the fourth wave 8,073; the sixth wave 6,574; and the eighth wave 5,461 respondents.

We excluded the youngest cohort from the investigation, because its members were mostly underage when the second wave was carried out. Our analyses included all person-observations from respondents having data available regarding all the investigated variables, and who were included in the study waves of both the baseline and outcome. The term baseline refers to the time of measuring the main independent variables and covariates, and outcome refers to the time of measuring the dependent variables. Consequently, our final sample contains 9,341 person-observations from 4,133 unique persons across four waves that were collected between 2009 and 2016.

This study aims to investigate the reciprocity of intergenerational support from the viewpoint of adult children. We examine whether the extent of previously received support from parents is associated with the extent of given support to parents, using the dependent variables: given practical help, financial aid, personal care and emotional support. During the interview, respondents were asked how often they had during the past 12 months: 1) given help with shopping, housework, or yard-work to their parents, that is, practical help; 2) given financial support to their parent, that is, given financial aid; 3) given help in nursing or taking care of their parents, that is, given personal care; 4) talked about

their parents' worries and troubles with them, that is, given emotional support. The questions were asked separately regarding respondents' mothers and fathers. Measuring the frequency of support involved asking the respondents to report how often they had provided each type of support (0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = very often). Table 1 presents descriptive statistics of these variables.

The support a respondent has received from their mother or father concerns the main independent variables in our analyses, which are: received emotional support, that is, discussions about own worries and troubles; practical help, that is, help with shopping, housework or yard-work; and financial aid. Only few adult respondents had received personal care, and therefore it was left out from the analyses. Instead of personal care, we investigated the effects of received help with childcare, that is, grandparental care. Respondents with children under 12 years were asked how often their parents had looked after or taken care of their children during the past 12 months. All these forms of received support were measured by using the same scale as per given support (0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = very often).

As mentioned above, prior studies indicate that intergenerational relations and reciprocal support patterns may differ between men and women (e.g., Evandrou et al. 2018; Geurts et al. 2012; Silverstein et al. 2002). Therefore, we conducted separate analyses for the four gender-constellations of parent-child relations: son-mother, son-father, daughter-mother and daughter-father.

We also controlled for several potentially confounding variables to obtain more robust results. These covariates were assessed at baseline, that is, one study wave before the outcome measure. The covariates comprise: the respondent's age at the time of interview, marital status, years of education, ethnicity, perceived health, labour force status, satisfaction with the financial situation, the number of own children and whether the respondent lives in East Germany. Covariates regarding characteristics

of the respondents' parents comprise: age of parent at the time of interview, cohabitation status of parent and travel distance between respondents and their parents measured in minutes. In the analyses, we also controlled for the time distance between the interviews. Table 1 presents the descriptive statistics of these variables.

Table 1. *Descriptive statistics.*

	Total no.	No. of persons	%	Mean (SD)	Within SD
Gender					
Male	4211	1891	45		
Female	5129	2242	55		
Age at the interview	9341	4134		34 (5.32)	1.41
Ethnicity					
German native	7628	3377	82		
Ethnic-German Immigrant	377	162	4		
Half-German	562	240	6		
Turkish background	165	76	2		
Other non-German background	609	279	7		
Living in East Germany					
No	6597	2820	71		
Yes	2744	1354	29		
Years in education	9341	4134		13.6	0.37
Marital status					
Never married	3880	1930	42		
Married/civil union	4865	2285	52		
Divorced	596	328	6		
Respondents' health					
Bad	200	179	2		
Not so good	943	781	10		
Satisfactory	2116	1606	23		
Good	4185	2707	45		
Very Good	1897	1368	20		
Labor force status					
Full-time Employed	4685	2397	50		
Other employed	2687	1498	29		
Unemployed	467	372	5		
In education	461	357	5		
Homemaker	839	625	9		
Other	202	161	2		
Satisfaction of financial situation (0-10)	9341	4134		6.35 (2.44)	1.24
Number of children	9341	4134		1.09 (1.10)	0.24
Age of mother	9341	4134		60 (7.53)	1.41
Mother's cohabitation status					
No partner	2003	996	21		
Respondent's father	5900	2655	63		
Other partner	1438	725	15		
Timely distance to mother					
Same house	1573	855	17		
Less than 10 minutes	2485	1329	27		
10 to 30 minutes	1935	1144	21		
30 to 60 minutes	1053	641	11		
1 to 3 hours	1027	570	11		
Over 3 hours	1268	625	14		
Received support from mother					
Emotional support	9341	4134		1.58 (1.04)	0.51
Practical help	9341	4134		0.79 (1.07)	0.61
Financial aid	9341	4134		0.67 (1.04)	0.56
Childcare	4826	2349		1.93 (1.26)	0.56
Provided support to mother					
Emotional support	9341	4134		1.78 (1.02)	0.52
Practical help	9341	4134		1.22 (1.33)	0.53
Financial aid	9341	4134		0.32 (0.82)	0.40
Personal care	9341	4134		0.26 (0.73)	0.45
Age of father	7446	3351		62.45 (7.71)	1.38
Father's cohabitation status					
No partner	590	333	8		
Respondent's mother	5763	2590	77		
Other partner	1093	556	15		
Timely distance to father					
Same house	1169	640	16		
Less than 10 minutes	1967	1036	26		
10 to 30 minutes	1480	899	20		
30 to 60 minutes	848	517	11		
1 to 3 hours	896	494	12		
Over 3 hours	1086	556	15		
Received support from father					
Emotional support	7446	3351		1.18 (0.94)	0.49
Practical help	7446	3351		0.73 (1.04)	0.59
Financial aid	7446	3351		0.65 (1.03)	0.57
Childcare	3877	1917		1.56 (1.27)	0.54
Provided support to father					
Emotional support	7446	3351		1.26 (0.96)	0.51
Practical help	7446	3351		1.05 (1.10)	0.53
Financial aid	7446	3351		0.21 (0.68)	0.35
Personal care	7446	3351		0.21 (0.66)	0.39

Notes. Total no. = Number of total person-observations, No. of persons = Number of unique persons;  
SD = Overall standard deviation; Within SD = Within-person standard deviation

We analysed the longitudinal data by using multilevel linear regression models, in which the repeated measures (person-observations) are nested within the respondents. Although the investigated dependent variables were not all normally distributed, we did not use logit models due to the limitations of these models (see Mood 2010 for discussion). Instead, we ran sensitivity analyses using logit models, producing similar results (not shown) to the main analyses reported here; consequently, the loss of information is considered small. We tested both between-person and within-person associations. Between-person effects represent the results across individuals, meaning in practice, the association between the mean scores for dependent and independent variables; within-person effects estimate associations over time between individuals' variation in the variables (Curran & Bauer 2011). In estimating the within-person effects, the observed respondents serve as their own controls and all the time-invariant components are eliminated in the models as for individual fixed-effects models (Allison 2009). Within-person effects are estimated because they provide a stronger test for the causal association between received and given intergenerational support over time than pooled or cross-sectional regressions.

## **Results**

### ***Transition probabilities***

First, we provide descriptive results for the participants who have within-person data and are subsequently included in within-person models. According to transition probabilities of received childcare help from parents, most individuals remains in the same categories; when changes occur, transition is more common between categories close to each other than those further apart. The transition probabilities show similar patterns regarding received emotional support from parents, although more transitions exist from one category to another. Regarding transition probabilities of received practical help and financial aid, no clear patterns appear compared to those for received

childcare help or emotional support. In many cases, the majority of individuals remains in the same category or the emphasis moves to the adjacent category, but transitions also occur between more distant categories. All transitions probabilities are shown in the appendix tables (Appendices 1–4). Stability and change in the provision of intergenerational support were measured by intraclass correlations, which show the correlation among person-observations for an individual over time. The intraclass correlations varied between 0.58 and 0.83; this variation indicates relatively high stability between the study rounds.

### *Associations between received and provided support*

The analyses investigated the associations between received and given intergenerational support (emotional support, practical help, financial aid, personal care) in four gender-dyads (son-mother, son-father, daughter-mother, daughter-father). We started our analyses by running total models, which mostly resulted in positive associations between received and provided intergenerational support. In the total models, all observations are pooled together and the results consist of both between- and within-person effects, that is, forced into one effect. Therefore, total models may provide insufficient and inaccurate information regarding the associations between received and provided support. Hence, our analyses concentrated on the results from between- and within-person models, although the total effects are also shown in Tables 2–5.

### *Support between sons and mothers*

Table 2 presents the results regarding the provision of support between sons and mothers. According to between-person models, all four forms of previously received support are positively associated with the given emotional support. In contrast, the results from within-person models show negative associations, although only the negative association between received and given emotional support is

statistically significant. This negative association means that sons who had experienced an increase in received emotional support from their mothers, later provided less emotional support to their mothers. Additionally, a marginally significant ( $p < 0.1$ ) negative association was discovered between received practical help and provided emotional support.

Between-person models also showed significant positive associations between each examined form of previously received support from mothers and provided practical help to mothers. In within-person models, only the negative association between received and given practical support is statistically significant, meaning that sons experiencing increases in practical help received from their mothers, later gave less practical help to their mothers. Additionally, a marginally significant positive association was discovered between previously received financial aid and given practical help.

According to the between-person models, the provision of financial aid to mothers by sons is positively associated with previously received emotional support and practical help; however, no other significant associations were found. Within-person models show a significant positive association between received emotional support and given financial aid, indicating that those sons with increased emotional support received from their mother more often later provided financial transfers to their mothers. A marginally significant positive effect was also found in the case of received childcare help.

Results based on between-person models show that the provision of care from sons to mothers is positively associated with previously received emotional support and financial aid. No significant results were found based on within-person models, although the positive association between received financial aid and provided personal care was marginally significant.



Table 2. Son-mother dyad: the associations between previously received support and given support.

	<b>Given emotional support</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.27	0.000	0.24	0.30	0.54	0.000	0.50	0.58	-0.07	0.000	-0.12	-0.03
Practical help	0.04	0.004	0.01	0.07	0.17	0.000	0.12	0.21	-0.03	0.066	-0.07	0.00
Financial aid	0.03	0.057	0.00	0.06	0.09	0.000	0.05	0.14	-0.03	0.207	-0.06	0.01
Childcare help	0.06	0.007	0.02	0.10	0.14	0.000	0.08	0.19	-0.03	0.351	-0.09	0.03

  

	<b>Given practical help</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.09	0.000	0.05	0.12	0.22	0.000	0.17	0.26	-0.03	0.187	-0.07	0.01
Practical help	0.06	0.000	0.03	0.09	0.21	0.000	0.16	0.25	-0.05	0.009	-0.08	-0.01
Financial aid	0.09	0.000	0.06	0.12	0.14	0.000	0.09	0.19	0.04	0.052	0.00	0.08
Childcare help	0.11	0.000	0.07	0.15	0.22	0.000	0.16	0.28	-0.03	0.327	-0.09	0.03

  

	<b>Given financial aid</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.06	0.000	0.04	0.09	0.08	0.000	0.04	0.12	0.05	0.005	0.02	0.09
Practical help	0.02	0.105	0.00	0.04	0.06	0.003	0.02	0.10	-0.02	0.310	-0.04	0.01
Financial aid	0.00	0.778	-0.03	0.02	0.00	0.872	-0.04	0.04	0.00	0.850	-0.04	0.03
Childcare help	0.02	0.194	-0.01	0.04	0.00	0.852	-0.04	0.04	0.03	0.098	-0.01	0.07

  

	<b>Given care</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.04	0.001	0.01	0.06	0.06	0.000	0.03	0.09	0.01	0.722	-0.03	0.04
Practical help	0.00	0.898	-0.02	0.02	0.02	0.151	-0.01	0.06	-0.02	0.186	-0.05	0.01
Financial aid	0.04	0.000	0.02	0.06	0.05	0.003	0.02	0.08	0.03	0.074	0.00	0.06
Childcare help	0.01	0.708	-0.02	0.04	0.02	0.298	-0.02	0.06	-0.01	0.58	-0.06	0.03

Emotional support, practical help, financial aid: number of observations 4211, number of groups 1891  
 Childcare: number of observations 1779, number of groups 897

### *Support between sons and fathers*

Next, we examined the provision of intergenerational support in the son–father dyads. Table 3 presents these results. According to between-person models, all four forms of received support are positively associated with the given emotional support. Instead, based on within-person models, only significant (negative) association was found between received and provided emotional support, meaning that the increased emotional support sons received from their fathers was associated with

later decreased emotional support to their father. Additionally, a marginally significant negative association was found between received financial aid and provided emotional support to father.

Table 3. Son-father dyad: the associations between previously received support and given support.

	<b>Given emotional support</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.27	0.000	0.23	0.30	0.54	0.000	0.50	0.59	-0.06	0.010	-0.11	-0.02
Practical help	0.07	0.000	0.04	0.10	0.20	0.000	0.15	0.25	-0.02	0.228	-0.06	0.015
Financial aid	0.03	0.056	0.00	0.06	0.12	0.000	0.07	0.17	-0.04	0.074	-0.08	0.004
Childcare help	0.04	0.068	0.00	0.09	0.09	0.006	0.02	0.15	0.003	0.923	-0.07	0.073

  

	<b>Given practical help</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.09	0.000	0.06	0.13	0.19	0.000	0.14	0.25	0.00	0.861	-0.05	0.06
Practical help	0.08	0.000	0.05	0.11	0.21	0.000	0.15	0.26	-0.02	0.340	-0.06	0.02
Financial aid	0.07	0.000	0.04	0.11	0.11	0.000	0.06	0.17	0.04	0.087	-0.01	0.09
Childcare help	0.03	0.188	-0.02	0.08	0.10	0.003	0.03	0.17	-0.06	0.108	-0.13	0.01

  

	<b>Given financial aid</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.04	0.003	0.01	0.07	0.05	0.021	0.01	0.09	0.04	0.047	0.00	0.08
Practical help	-0.02	0.189	-0.04	0.01	0.001	0.957	-0.04	0.04	-0.04	0.007	-0.07	-0.01
Financial aid	-0.01	0.256	-0.04	0.01	-0.03	0.092	-0.08	0.01	0.003	0.843	-0.03	0.04
Childcare help	0.00	0.701	-0.02	0.03	0.02	0.274	-0.02	0.06	-0.01	0.706	-0.04	0.03

  

	<b>Given care</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.04	0.002	0.01	0.06	0.07	0.000	0.04	0.11	0.003	0.875	-0.03	0.04
Practical help	0.01	0.378	-0.01	0.03	0.02	0.204	-0.01	0.05	-0.005	0.743	-0.03	0.02
Financial aid	0.01	0.353	-0.01	0.03	0.02	0.178	-0.01	0.06	-0.01	0.703	-0.04	0.02
Childcare help	-0.01	0.417	-0.04	0.02	-0.01	0.660	-0.05	0.03	-0.01	0.665	-0.06	0.04

Emotional support, practical help, financial aid: number of observations 3388, number of groups 1538  
 Childcare: number of observations 1411, number of groups 722

Regarding provided practical help to fathers, between-person models again show significant positive associations with all examined forms of previously received support from fathers. No significant within-person effects were found, although a marginally significant association was discovered between received financial aid and given practical help.

According to between-person models, the provision of financial aid to a father is positively associated with previously received emotional support, but otherwise no significant between associations were found. Within-person models also show a significant positive association between received emotional support and given financial aid to a father, meaning that sons who had experienced an increase in received emotional support from their fathers, later gave more financial aid to their fathers. In contrast, a negative within-person association was found between received practical help and given financial aid, which indicates that sons who received increased practical help from their fathers, later gave financial transfers to their fathers less often.

In the analyses of provided personal care to fathers by sons, between-person models showed a significant positive association between previously received emotional support and provided care. No other significant between or within associations were found.

#### *Support between daughters and mothers*

Table 4 presents the results regarding the associations between previously received support and provided support in daughter–mother dyads. According to the between-person models, all investigated forms of previously received support are significantly and positively associated with the provided emotional support. On the contrary, within-person models show a significant negative association between received emotional support and provided emotional support, meaning that daughters who had experienced an increase of received emotional support from their mothers, later provided less emotional support to their mother. However, a marginally significant association was also found between received help with childcare and provided emotional support to a mother.

Table 4. Daughter-mother dyad: the associations between previously received support and given support.

<b>Given emotional support</b>												
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.26	0.000	0.24	0.29	0.51	0.000	0.48	0.55	-0.09	0.000	-0.12	-0.05
Practical help	0.06	0.000	0.03	0.08	0.17	0.000	0.13	0.21	-0.02	0.313	-0.05	0.02
Financial aid	0.07	0.000	0.04	0.10	0.11	0.000	0.07	0.16	0.03	0.128	-0.01	0.06
Childcare help	0.10	0.000	0.07	0.13	0.16	0.000	0.12	0.21	0.04	0.062	0.00	0.09

  

<b>Given practical help</b>												
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.10	0.000	0.07	0.12	0.18	0.000	0.14	0.22	0.02	0.275	-0.02	0.06
Practical help	0.06	0.000	0.03	0.08	0.15	0.000	0.11	0.20	-0.02	0.310	-0.05	0.02
Financial aid	0.06	0.000	0.03	0.09	0.14	0.000	0.09	0.18	0.01	0.648	-0.03	0.04
Childcare help	0.05	0.004	0.02	0.08	0.12	0.000	0.07	0.16	-0.04	0.073	-0.09	0.00

  

<b>Given financial aid</b>												
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.00	0.812	-0.02	0.02	0.03	0.022	0.00	0.06	-0.02	0.149	-0.04	0.01
Practical help	0.01	0.196	-0.01	0.03	0.02	0.139	-0.01	0.05	-0.002	0.854	-0.02	0.02
Financial aid	-0.01	0.301	-0.03	0.01	-0.03	0.123	-0.06	0.01	-0.001	0.903	-0.03	0.02
Childcare help	0.02	0.107	0.00	0.04	0.01	0.579	-0.02	0.04	0.01	0.368	-0.01	0.04

  

<b>Given care</b>												
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.03	0.010	0.01	0.05	0.06	0.000	0.03	0.09	-0.02	0.200	-0.06	0.01
Practical help	0.02	0.158	-0.01	0.04	0.04	0.009	0.01	0.07	-0.02	0.244	-0.05	0.01
Financial aid	0.02	0.137	-0.01	0.04	0.04	0.006	0.01	0.08	-0.01	0.410	-0.04	0.02
Childcare help	0.01	0.566	-0.02	0.03	0.01	0.503	-0.02	0.05	-0.01	0.664	-0.05	0.03

Emotional support, practical help, financial aid: number of observations 5129, number of groups 2242  
 Childcare: number of observations 3047, number of groups 1452

In the investigation of the provided practical help to mothers by daughters, we again found that received support from parents is positively associated with later provision of support to parents, but these positive effects were based only on between-person investigations. Within-person models did not provide any statistically significant results, although a marginally significant negative association was discovered between previously received childcare help and provided practical support.

In the analyses of provided financial aid to mothers by daughters, between-person models showed positive associations between received emotional support and provided financial aid. Otherwise, no

significant between-person or within-person effects were found. Regarding the provision of care to mothers by daughters, between-person models show that previously received emotional support, practical help and financial aid are positively associated with the provided care. However, the analyses did not result in other significant differences between or within associations regarding provided care from daughters to mothers.

#### *Support between daughters and fathers*

Finally, we analysed the association of received and provided intergenerational support in daughter–father dyads. These results are presented in Table 5. Once again, we found that all four forms of received support from fathers predicted later provision of emotional support to fathers, but these positive associations are based on between-person models. According to within-person models, previously received emotional support is negatively associated with provided emotional support, meaning that daughters who had experienced an increase in emotional support received from their fathers, later gave less emotional support to their fathers. No other significant associations were found.

Between-person models showed significant positive associations between each examined form of received support and provided practical help to fathers. According to within-person models, however, we found only a significant (negative) association between received help with childcare and given practical help, meaning that an increase in the extent of childcare help that daughters received from their father was associated with a decrease in the practical help later provided to fathers.

According to between-person models, the provision of financial aid to fathers by daughters is positively associated with previously received emotional support. Within-person models show positive association between received practical help and given financial aid, meaning that daughters

who received increased practical help from their fathers later provided more financial aid to their fathers. No other significant results were found in either model.

Regarding provided personal care to fathers by daughters, between-person models show that received emotional support, practical help and financial aid are positively associated with the provided care. Within-person models did not result in any significant associations between any of the examined form of received support and provided care.

Table 5. Daughter-father dyad: the associations between previously received support and given support.

	<b>Given emotional support</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.30	0.000	0.27	0.33	0.56	0.000	0.52	0.60	-0.09	0.000	-0.13	-0.04
Practical help	0.05	0.002	0.02	0.08	0.16	0.000	0.11	0.21	-0.02	0.250	-0.06	0.02
Financial aid	0.04	0.010	0.01	0.07	0.09	0.000	0.04	0.14	-0.002	0.925	-0.04	0.04
Childcare help	0.08	0.000	0.04	0.11	0.14	0.000	0.09	0.19	0.01	0.791	-0.05	0.06
	<b>Given practical help</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.11	0.000	0.08	0.15	0.22	0.000	0.18	0.26	0.01	0.527	-0.03	0.06
Practical help	0.06	0.000	0.03	0.09	0.18	0.000	0.14	0.23	-0.03	0.111	-0.07	0.01
Financial aid	0.05	0.001	0.02	0.08	0.13	0.000	0.08	0.18	-0.01	0.716	-0.05	0.03
Childcare help	0.04	0.040	0.00	0.07	0.10	0.000	0.05	0.15	-0.05	0.035	-0.10	0.00
	<b>Given financial aid</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.02	0.015	0.00	0.04	0.05	0.000	0.02	0.07	0.002	0.900	-0.02	0.03
Practical help	0.02	0.026	0.00	0.04	0.02	0.254	-0.01	0.04	0.02	0.036	0.00	0.05
Financial aid	-0.01	0.373	-0.03	0.01	-0.02	0.194	-0.05	0.01	-0.004	0.771	-0.03	0.02
Childcare help	0.01	0.148	0.00	0.03	0.02	0.251	-0.01	0.04	0.01	0.392	-0.01	0.04
	<b>Given care</b>											
	Total effect				Between effect				Within effect			
	95 % CI				95 % CI				95 % CI			
	coef.	p	lower	upper	coef.	p	lower	upper	coef.	p	lower	upper
Emotional support	0.03	0.004	0.01	0.06	0.07	0.000	0.04	0.10	-0.01	0.612	-0.04	0.03
Practical help	0.02	0.085	0.00	0.04	0.06	0.000	0.03	0.09	-0.01	0.334	-0.04	0.01
Financial aid	0.01	0.196	-0.01	0.04	0.04	0.015	0.01	0.07	-0.01	0.524	-0.04	0.02
Childcare help	-0.01	0.632	-0.03	0.02	-0.01	0.410	-0.05	0.02	0.001	0.949	-0.04	0.04

Emotional support, practical help, financial aid: number of observations 4057, number of groups 1812  
 Childcare: number of observations 2466, number of groups 1195

### *Summary of main findings*

Table 6 shows a summary of the results from between- and within-person models. According to the results based on between-person investigations, previously received support was mainly positively associated with provided support. These associations mostly did not hold in within-person models, however. Within-person investigations show that in both son-mother and son-father dyads, sons who had experienced increased emotional support from a parent later gave more financial support to that parent. Regarding female respondents, we found only one positive significant within-person association: daughters who received increased practical help from their father later provided more financial aid to their father. No other significant positive associations between received and provided support were found based on within-person models. Instead, for some types of support, within-person models resulted in significant negative associations: in all four gender-dyads, an increase in received emotional support was associated with decreased emotional support given later. In addition, daughters who received increased help with childcare from their father, later gave less practical help their father. Similarly, those sons who received increased practical help from their mother, later provided less practical help to their mother. Moreover, between sons and fathers, an increase in the level of received practical help was negatively associated with given financial support. Compared to between-person effects, however, the magnitude of all statistically significant within-person effects were small.

Table 6. Summary of results: associations between previously received and provided support.

Time 1: Received support from parent	Time 2: Provided support to parent							
	Emotional support		Practical help		Financial aid		Care	
	BE	FE	BE	FE	BE	FE	BE	FE
<i>Emotional support</i>								
Son - mother	POS	NEG	POS	ns	POS	POS	POS	ns
Son - father	POS	NEG	POS	ns	POS	POS	POS	ns
Daughter - mother	POS	NEG	POS	ns	POS	ns	POS	ns
Daughter - father	POS	NEG	POS	ns	POS	ns	POS	ns
<i>Practical help</i>								
Son - mother	POS	ns	POS	NEG	POS	ns	ns	ns
Son - father	POS	ns	POS	ns	ns	NEG	ns	ns
Daughter - mother	POS	ns	POS	ns	ns	ns	POS	ns
Daughter - father	POS	ns	POS	ns	ns	POS	POS	ns
<i>Financial aid</i>								
Son - mother	POS	ns	POS	ns	ns	ns	POS	ns
Son - father	POS	ns	POS	ns	ns	ns	ns	ns
Daughter - mother	POS	ns	POS	ns	ns	ns	POS	ns
Daughter - father	POS	ns	POS	ns	ns	ns	POS	ns
<i>Childcare help</i>								
Son - mother	POS	ns	POS	ns	ns	ns	ns	ns
Son - father	POS	ns	POS	ns	ns	ns	ns	ns
Daughter - mother	POS	ns	POS	ns	ns	ns	ns	ns
Daughter - father	POS	ns	POS	NEG	ns	ns	ns	ns

Notes:

POS = significant positive association; NEG = significant negative association; ns = non-significant association (significance threshold:  $p < 0.05$ )

## Discussion

This article examined reciprocity of intergenerational support from the viewpoint of adult children. By using multilevel models and distinguishing between-person and within-person effects, we investigated whether a change in previously received support from parents is associated with later provisions of support to parents. If reciprocity is an influencing factor in intergenerational support, we would expect to find that the increase in previously received support is positively associated with the given support.

Total models mainly resulted in positive associations between the received and provided intergenerational support. These results are consistent with prior studies that have found evidence for intergenerational reciprocity (e.g., Evandrou et al. 2018; Geurts et al. 2012; Silverstein et al. 2002). However, our analyses revealed that the total effects are strongly dominated by the between-person effects, while the within-person effects are largely insignificant. Additionally, when significant, the magnitude of the within effects are small, meaning that their substantive significance is rather minor.



Our results do not provide notable evidence for intergenerational reciprocity of support; the extent of provided support varies between families. However, an increase in received support does not largely predict a greater level of support provided later within families. This corresponds to the concept of reciprocal altruism (Trivers 1971). According to reciprocal altruism, all else being equal, the investments between close relatives are based on altruism rather than reciprocal exchange of resource. By investing in their children, individuals can enhance their inclusive fitness, that is survival of their genes; thus, parents are inclined to support their own children, and children are not expected to reciprocate the support they receive from their parents.

Although we did not find evidence for reciprocity, the results indicate that family lines differ from each other regarding provision of intergenerational support. The positive between-person associations may be due to unobservable cultural factors such as familistic values. For instance, in families with both a strong demand for mutual help among family members and a higher quality of intergenerational relationships, observations in both downward and upward flows of intergenerational transfers are more likely. This means that support may be received and provided even in the absence of genuine reciprocity effects, that is, a causal impact of help received at a given point in time on help provided in the future. Our investigation focused solely on Germany, where familistic responsibilities are legally enforced. Examining whether the manifestation of intergenerational reciprocity is related to family values as well as other country-related factors, such as legal obligations towards family members, requires comparative investigation. For instance, Southern Europe is considered to represent a familistic region, whereas Northern Europe is perceived less familistic (e.g., Fokkema et al. 2008). Future studies could investigate whether the results regarding reciprocity correspond to the familistic features of these regions. Moreover, the influence of cultural and societal factors on intergenerational reciprocity could also be investigated on a global level. For example, reciprocity between family generations may be a more central issue in many Asian countries, where intergenerational obligations

are very strong (Sheng & Settles 2006) and public welfare services for families are scarce or non-existent. For example, a Chinese study showed that in families where grandparents had raised their grandchildren due to parents' labour migration, the middle generation (parents) felt stronger filial obligations toward the oldest generation (grandparents) than in families where grandparents had not taken the responsibility of such parenting duties (Cong & Silverstein 2012).

Intergenerational family relations are often asymmetric at a given time, and individuals' needs and possibilities to support vary during the life course. Parents usually provide more resources to children during earlier stages of their lives and this flow of support may be reversed when parents get older and their need for support increases. Since our investigation is based on a relatively short time period, our analyses possibly could not detect reciprocity taking place with changes in the asymmetry of intergenerational relationships. Parents may not yet need to receive support from their children, and adult children may still be more in need of support than are able to provide it. The combination of these factors, that is, the examined timeframe and needs for help versus opportunities to provide help, may relate to both the lack of reciprocity and particularly the negative within-person associations between received and provided support. Adult children who still need and receive support, may not yet be able to reciprocate, especially if their need for support is still increasing. Hence, more research based on panel data covering longer periods of an individual's life course is needed to explore the (lack of) intergenerational reciprocity.

Our analyses accounted for various factors relating to the needs and possibilities of intergenerational support, although we did not closely investigate their effects. Based on previous family studies, individuals' resources and their sufficiency affect patterns of intergenerational support (e.g., Szydlik 2016; Tanskanen et al. 2017; Tanskanen & Danielsbacka 2018). Consequently, the available resources may influence the demand for reciprocity. Further studies should investigate whether parents' resources, that is, the ability and need for support such as state of health or financial situation, affect

the manifestation of intergenerational reciprocity. For instance, the scarcer the parental resources, the stronger need there could be for reciprocity. Similarly, the more abundant the parental resources, the less need should exist for receiving the previously provided resources. Moreover, children's resources may affect how the children value the support they receive from their parents. For instance, if children are affluent, received financial transfers from parents may have a lower effect on later provided support to parents than if the received form of support had a higher value for the children.

To conclude, in light of current results, reciprocity is not an essential factor regarding the provision of intergenerational support. Previous family research has shown that intergenerational relationships usually include both downward and upward flows of investments (e.g., Albertini et al. 2007; Brandt 2013; Fingerman et al. 2011; Fokkema et al. 2008). Adult children are doubtlessly an important source of support for their parents, with the support potentially contributing to the well-being of ageing parents. However, investing in children does not seem to pay off in terms of returning rewards in the future. Future studies could stress this further by investigating the exchange of support between step-parents and step-children. On the grounds of the evolutionary approach, support between step-relatives could be based more on reciprocal exchange of resources in contrast with the biological parent-child relationship.

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**Appendix 1. Transitions in support variables: received emotional support**

	Time 1: Received emotional support																			
	Son - mother					Son - Father					Daughter - Mother					Daughter - father				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Time 2: Received emotional support																				
0 Never	293	175	51	10	3	339	185	35	4	2	143	98	40	14	2	286	161	41	10	1
1 Seldom	184	466	203	22	1	181	413	137	17	1	109	306	228	53	4	147	424	209	29	1
2 Sometimes	50	255	299	56	7	58	172	174	23	2	59	241	616	172	21	64	193	369	66	9
3 Often	13	41	82	63	8	9	27	41	17	1	12	55	239	284	42	11	26	78	69	13
4 Very often	0	3	14	12	3	0	2	6	1	0	2	11	39	61	31	0	4	9	14	5
Total n	540	587	649	163	22	587	799	393	62	6	325	711	1162	584	100	508	808	706	188	29

**Appendix 2. Transitions in support variables: received practical help**

	Time 1: Received practical help																			
	Son - mother					Son - Father					Daughter - Mother					Daughter - father				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Time 2: Received practical help																				
0 Never	999	171	107	26	15	795	138	98	22	8	1158	210	157	48	11	1025	180	93	40	6
1 Seldom	192	154	74	20	0	145	103	62	15	2	232	145	93	30	4	181	106	70	23	3
2 Sometimes	105	93	91	40	6	92	74	85	27	8	163	112	138	64	13	110	75	96	40	12
3 Often	47	32	63	29	7	36	28	36	29	6	48	43	76	68	12	31	30	42	27	8
4 Very often	13	7	13	8	2	8	7	11	11	1	9	4	11	20	13	5	2	14	15	5
Total n	1356	457	348	123	30	1076	350	292	104	25	1610	514	475	230	53	1352	393	315	145	34

**Appendix 3. Transitions in support variables: received financial aid**

	Time 1: Received financial aid																			
	Son - mother					Son - Father					Daughter - Mother					Daughter - father				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Time 2: Received financial aid																				
0 Never	1170	161	57	21	4	914	119	59	14	3	1469	177	105	28	10	1180	145	78	15	8
1 Seldom	227	97	44	11	0	189	85	33	12	1	242	124	68	15	3	187	88	40	11	3
2 Sometimes	120	83	104	24	2	101	65	79	18	2	149	93	91	35	7	116	70	72	23	9
3 Often	30	24	30	37	11	27	23	29	28	6	35	38	56	42	12	33	22	41	22	9
4 Very often	11	9	5	15	17	11	7	7	6	9	27	8	11	26	11	19	6	10	22	10
Total n	1558	374	240	108	34	1242	299	207	78	21	1922	440	331	146	43	1535	331	241	93	39

**Appendix 4. Transitions in support variables: received childcare help**

	Time 1: Received childcare help																			
	Son - mother					Son - Father					Daughter - Mother					Daughter - father				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Time 2: Received childcare help																				
0 Never	90	32	25	11	1	121	32	20	8	2	142	54	31	19	3	226	69	30	12	1
1 Seldom	47	73	56	8	0	40	69	40	8	0	46	91	86	26	5	59	98	69	20	6
2 Sometimes	20	61	131	53	5	15	41	96	41	4	46	91	199	98	16	30	77	148	55	13
3 Often	5	8	66	86	23	5	7	47	42	9	17	36	125	177	62	11	25	70	95	39
4 Very often	2	5	10	36	25	1	0	8	21	9	2	7	24	90	99	2	7	13	45	48
Total n	164	179	288	194	54	182	149	211	120	24	253	279	465	410	185	328	276	330	227	107