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## Review

## Prosocial development in adolescence

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## Abstract

In this review, we describe the development of prosocial behavior in adolescence as a critical inflection period for social adjustment. Experimental research using prosocial giving tasks demonstrates that adolescents differentiate more between recipients and contexts, suggesting increasing ingroup-outgroup differentiation during adolescence. We also demonstrate that social brain development during adolescence is partly driven by environmental influences, further underlining adolescence as a critical period for social development. The COVID-19 pandemic has had and will have long-term effects on the current generation of adolescents, for which we describe both the risks, resilience factors, and opportunities for engaging in prosocial acts of kindness.

## Addresses

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## Introduction

Adolescents in today's world grow up with several high-stake societal challenges, including the experience and aftermath of the COVID-19 crisis, which has a significant impact on well-being of young people [20]. Dealing with the challenges of the COVID-19 pandemic raises many social dilemmas, whereby individual self-interest at the short term is often at odds with the collective benefits in the longer term [28]. A recent large-scale study including participants over the life span (18–85-years) demonstrated that the COVID-19 pandemic had the largest negative effects on the lives of the younger ages (18–24-years) including loneliness, economic hardship, and job insecurity. Despite experiencing the most negative

consequences, adolescents adhered just as well to the COVID-19 restrictions as other age groups [25]. Thus, even though the challenges of the pandemic are affecting individuals of all generations, there may be asymmetric risks and costs depending on age.

Prosocial behavior or behavior that is directed at benefiting others is one of the behaviors that is the most important for the collective goals of coping with a health pandemic. Prior research showed that prosocial individuals, as measured by giving behavior, are less likely to put others at risk during the COVID-19 pandemic; they are more likely to follow physical distancing rules, stay home when they feel sick, or buy face masks [6]. Prosocial behavior develops and transitions throughout adolescence, and prosociality is shaped by social experiences [5]. However, prosocial behavior is a multifaceted construct and depends on various environmental and contextual factors [7]. This review summarizes recent studies on the development of prosocial behavior while distinguishing different motives for prosocial behavior. We will discuss adolescence as a sensitive window for social development based on recent insights into research on brain development. Finally, we discuss the effects of the current COVID-19 crisis on prosocial behavior in adolescence.

This review focuses on adolescence, as the transition period between childhood and adulthood, when individuals reach mature social goals and roles in society [9]. This wide developmental period consists of several phases, such as middle/late childhood (7–10 y.o.), puberty (11–14 y.o.), mid/late adolescence (15–18 y.o.), and early adulthood (19–25). Across adolescence, children start to expand their social world and gradually become adult members of society [3,41].

## Prosocial behavior

Prosocial behavior is defined as social behavior that benefits others, such as giving, helping, and sharing. Prosocial choices can be personally costly or noncostly but share the common feature that they benefit the welfare of others [28]. Prosocial behavior is a key element for developing reciprocal social relationships, and, therefore, it is particularly important during middle childhood and adolescence when there is a heightened need for social belonging such as group affiliation, more intense peer relations, and popularity [42]. Prosocial behavior has been described in the literature as a

multidimensional and multicultural construct [7], and there are different factors that influence the development of prosocial behavior.

The first factor that may influence the development of prosocial behaviors, such as giving, is whether there are strategic motivations. The various motivations involved in prosocial development can be disentangled based on experimental tasks that involve costly giving and sharing. The Dictator Game task is based on economic games involving a transition of goods (for example 10 coins) between two parties, a giver and a recipient. In typical Dictator Games where the recipient is a stranger and the giver will remain anonymous, individuals typically give 20–40%, showing some prosocial behavior [28]. However, when the recipient has the possibility to veto the outcome (known as the Ultimatum Game) by a yes or no decision (yes indicates acceptance of the offer, no resulting in no benefit for either party), giving increases up to 50%, showing that there are strategic motivations involved in giving [28]. It has been demonstrated in several developmental studies that strategic giving (Ultimatum Game) but not nonstrategic giving (Dictator Game) increases with age during adolescence, which is partly explained by the development of perspective-taking [23,36,44].

The second factor that may influence prosocial giving is whether there is a social relationship with the recipient. This factor is specifically relevant during adolescence, as this is a period of increased importance of peer relations. A prior study asked participants to distribute coins in a Dictator Game between themselves and a friend, a classmate, or a stranger. Giving was highest for the friends ( $\pm 50\%$ ), lower for classmates, and lowest for strangers ( $\pm 35\%$ ) [21], mirroring prior studies using the anonymous Dictator Game. Giving more to friends or ‘ingroup’ partners may indicate a need for social acceptance or expected reciprocity [16]. Moreover, giving to strangers (i.e. ‘outgroup’) but not giving to friends correlated with self-reported perspective-taking, suggesting that perspective-taking plays a critical role in managing ingroup-outgroup biases [21]. Indeed, a prior study comparing multiple age groups revealed that giving to ingroup members (friends) increased between ages 9–18 years, whereas giving to disliked others or strangers decreased with age, and this effect was partly mediated by the development of perspective-taking [23], see also [16].

The third factor that may influence prosocial giving is whether the other recipient is in need, that is, the favorable factor. Using an adapted Dictator Game, several studies examined giving to different targets in the first weeks of the pandemic (April 2020). Similar to previous studies, the first study showed that adolescents (aged 10–20-years) gave on average 39% of their resources to strangers and 51% to friends. However, individuals with COVID-19 and medical doctors received

even more, respectively, 69% and 76% of the resources [22], see Fig. 1. This pattern was also observed in children aged 10–13 years Fig. 1; unpublished data from [2]. A follow-up study in participants aged 10–25 years showed that giving to targets in need was highest in late childhood and decreased across development [45]. Even below the age of 10, in middle childhood, the favorable factor seems to play a role. A prior study used a sharing task showed that responding to the needs of others (i.e. recipients in poverty) through sharing increased between the second grade ( $\pm 7$  years) and fifth grade ( $\pm 10$  years). Moreover, giving to others was correlated with the participants’ subjective well-being, suggesting that ‘feeling good’ correlated with ‘doing good’ [40].

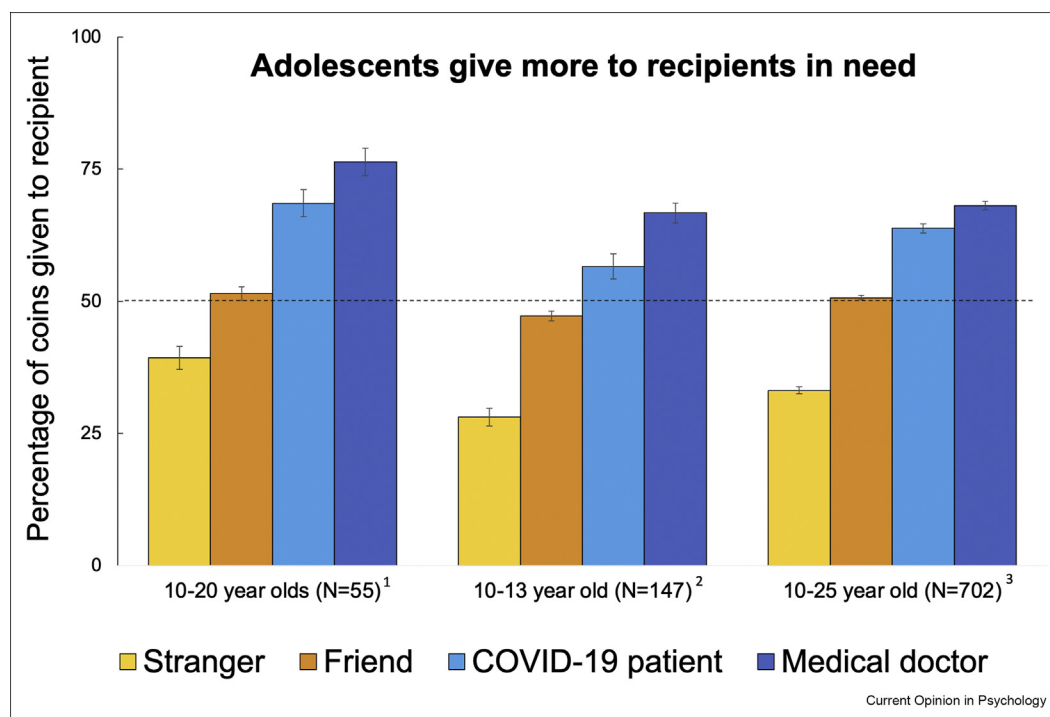
Together, these studies demonstrate that prosocial motivations are dependent on contextual social influences such as an individual’s strategic motivation, the social relation to the recipient, and whether the recipient is a target in need. These findings fit with a larger body of evidence showing that adolescence is an important transition period for developing prosocial intentions [7]. Prosocial intentions may provide the building blocks for engaging in broader societal contributions [18]. Adolescence might be a specifically sensitive period for developing prosocial intentions owing to ongoing maturation of brain regions involved in social processing [32].

## Social brain development

It has been suggested that adolescence is a sensitive window in social development, such that social experiences influence the development of prosocial motivations and behaviors. Initial evidence pointing in this direction comes from brain-imaging studies. Using magnetic resonance imaging (MRI), it is well-documented that there is a pronounced change in cortical neural development during adolescence. After an initial postnatal increase in cortical gray matter in the first 5–6 years of life, adolescents show a (second) period of postnatal change in the form of a reduction of gray matter leading to stability of neural density after early adulthood. Longitudinal MRI studies demonstrated a decrease in gray matter that is most protracted in the ‘social brain’ regions including the medial prefrontal cortex, temporal-parietal junction, and superior temporal sulcus [32]. Longitudinal studies have related the within-subject anatomical development of social brain regions to within-subjects changes in self-reported friendship quality, showing that higher friendship quality over time relates to faster gray matter change in social brain regions [4].

Even though longitudinal studies provide an important index of co-occurrence of developmental processes, they do not allow for causal inference. Possibly, changes in both the brain and behavior are driven by genetically co-occurring processes. One particularly elegant way to

Fig. 1



Giving to different targets. Three different experimental studies showed that adolescents give most resources to recipients in need, such as patients with COVID-19 and medical doctors. The dotted line represents half of the resources, and percentages mentioned previously indicate that adolescents give more than they keep for themselves. <sup>1</sup> van de Groep et al., 2020 (N = 55, M<sub>age</sub> = 16). <sup>2</sup> unpublished data from the L-CID COVID study of [2] (N = 147, M<sub>age</sub> = 12). <sup>3</sup> [45] (N = 702, M<sub>age</sub> = 17).

study influences of genetics and environment is using a twin design: by comparing monozygotic twins (who share 100% of their genes) with dizygotic twins (sharing  $\pm$  50% of their genes), it is possible to disentangle the effects of sharing their environment from genetic influences. Behavioral genetic modeling using monozygotic and dizygotic twins can provide estimates for this heritability [33]. Studies including 7–8-year-old twins showed that total brain volume and part of the social brain network were strongly sensitive to genetic influences (Fig. 2) [31,46]. However, the temporal-parietal junction also showed estimates of shared environment effects, providing more direct evidence that these regions are also shaped by social experiences (Fig. 2). These results fit well with data from fMRI resting state analyses, which also reveal that certain cortical-subcortical connections, which have previously been found to develop during adolescence [15] are influenced by shared environmental effects [1] (Fig. 2). Together, these findings provide evidence for adolescence as a period during which the environment matters for social development.

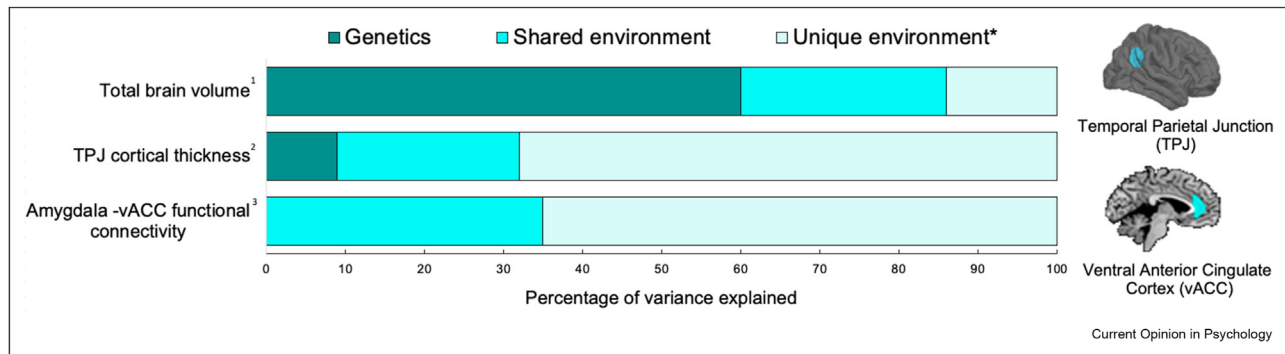
### COVID-19 and prosocial development: a special case of environmental influence

The COVID-19 crisis has an unprecedented environmental impact on the development of youth. In addition

to health concerns for family members and friends, adolescents also experienced social restrictions such as school closure and reduced possibilities for social contact [35]. School closures during the pandemic were associated with lower levels of academic motivations in 12–16-year-old adolescents, an effect which was larger for adolescents with lower parental support and was buffered by daily positive mood [27]. A longitudinal study with measurements before and during the COVID-19 pandemic revealed that the stress experienced by parents during lockdown negatively impacted well-being of 10–13-year-old children [2]. Parental stress was particularly high among low-income households [8], which may indicate that the pandemic may have the most impact on economically disadvantaged families and children. Indeed, not all adolescents have the same opportunities to contribute to society owing to inequalities in social gradients, and this may impact adolescents' fundamental need to experience a sense of purpose and meaning [19]. Moreover, adolescents showed longitudinal decrease in feelings of vigor and increase in feelings of tension and depression over the course of the pandemic ([20] see also [14]).

How these experiences influence prosocial behaviors is currently not well understood. The pandemic places large demands on prosocial behavior, and lots of

Fig. 2



Genetic and environmental influences on brain development. Variance in both structural brain anatomy and functional brain connectivity can be explained by (shared and unique) environmental influences, indicating they are shaped by social experiences. \*Note that unique environmental influences include all variances that are not explained by genetics or the shared environment and thus also includes measurement errors. <sup>1</sup> [31]; <sup>2</sup> [46]; <sup>3</sup> [1].

adolescents need to adjust their daily activities and future perspectives for the benefit or collective health of the broader society. Social connections have been limited especially for young people, whereas these may serve as a source of social support during challenging times [29,38]. Prosocial experiences toward friends decreased during the first weeks of the pandemic [22] but increased over several months in the pandemic [45]. Social connections are an important predictor for prosocial behavior during the pandemic, such that 10–12-year-old adolescents with more connections were more willing to help unknown peers [39]. Possibly, over time at least some of the adolescents will show resilience to long-term effects of the pandemic. However, for youth to remain resilient during challenging social times, they need support and opportunities at multiple levels in society [30].

## Conclusion

This review provided an overview of key factors in the development of prosocial behavior in adolescence, and we related these to the challenges of the current COVID-19 pandemic. Today's generation faces the crisis of not only the COVID-19 pandemic but also increasing social-economic inequality and the climate crisis. Social connectedness in adolescence is an important resilience factor that has been shown to reduce stress and fatigue during COVID-19 [34], and engaging in prosocial acts of kindness may boost social connections. Indeed, a recent meta-analysis revealed a relation between prosociality and mental well-being in adolescents [24]. It is recommended that future research examines more closely the individual predictors of kindness, the recipients of kindness, and the proximity of the outcomes [11]. Adolescents show great resilience when the systems around them are also resilient [30].

Adolescence is a sensitive inflection time in development [12]. The proportion of individuals with onset of any mental disorders before the ages of 25 is 62.5%, with a peak onset age of 14.5 [43], showing that adolescence is a vulnerable time where mental disorders first emerge. Yet, it is also a time of tremendous opportunity for social development, overcoming ingroup-outgroup bias, contribution to society, and providing solutions to the challenges of the future [17]. Thus, research on prosocial development of adolescents is not only important for individual developmental trajectories but also to inform policy and engage adolescents more widely, for example, through youth participation, and this review shows that adolescence is an important time for societal investment [12].

## Box: youth participation

An important next step in addition to brain research and survey/experimental studies is to enrich our research with perspectives from young people. Three examples to broaden the scientific perspective are citizen science, cocreation, and living laboratories. Citizen science is an important method in which young people are engaged as 'citizens' to help with reaching under-represented groups in research, for example, through snowballing methods [10]. Cocreation is an important part of participatory research that can help to inform the questions that scientists ask and to properly inform the suitability of design [37]. Finally, living laboratories are a useful design approach to involve relevant stakeholders early on in the process of research to ensure reaching common goals and increasing the chances that outcomes of research will be used in policy. Living laboratories are more intensive than cocreation because of the use of iterative (i.e. interacting back and forth) design steps [13]. Incorporating youth in the scientific process has many advantages for both scientists and the society, as adolescents tend to be more creative in their problem solving [26]. Moreover, providing adolescents with the opportunity to inform science and policy contributes to their sense of autonomy, which in turn can improve their mental well-being [18].



## Conflict of interest statement

Nothing declared.

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