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Paths to the Light and Dark Sides of Human Nature: A Meta-analysis of the Prosocial Benefits of Autonomy and the Antisocial Costs of Control

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Abstract

Self-determination theory (SDT) posits that experiences of autonomy lead people to be more prosocial, whereas experiences of control lead to antisocial actions. In this meta-analysis, we tested the links between autonomy and prosociality, and control and antisociality, across 139 reports (167 studies) with 1,189 effect sizes (*N* = 75,546 participants). We used two-stage structural equation modelling including both correlational and longitudinal study designs. We found support for the hypothesized direct links between autonomy and prosociality, and between control and antisociality, with cross-paths between these constructs being weaker. In line with SDT's claims that the salutary effects of autonomy are universal, results also showed that the hypothesized links were consistent across cultures, genders, and age categories. We also reviewed emerging experimental research on the effect of autonomy-priming interventions on prosociality. To conclude, we discuss the theoretical and practical implications of these findings and lay out an agenda for future research.

Public Significance Statement

Increasing prosocial behaviors and reducing antisocial tendencies is a critical challenge across many areas of policy. This review systematically assessed the available evidence on whether experiences of autonomy (and reductions in control, its opposite) facilitate prosocial outcomes and undermine antisocial behaviors. We found that autonomy was linked with more prosociality, across a wide range of contexts, while control was consistently linked with antisocial outcomes.

Paths to the Light and Dark Sides of Human Nature: A Meta-analysis of the Prosocial Benefits of Autonomy and the Antisocial Costs of Control

Improving interpersonal and social cooperation is one of the most critical challenges of our time (MacAskill, 2016). Prosociality, which is manifest in behaviors enacted voluntarily to improve the welfare of others (Eisenberg et al., 2007; Schwartz & Bilsky, 1990), is an essential factor in positive relationships and social cohesion (Ding et al., 2018). Cultivating prosociality is critical across multiple public policy domains, with topical examples including building community cooperation, increasing adherence to public health messages, and voluntary efforts by companies to curb carbon emissions (Biglan, 2015; Ryan & Deci, 2017). Prosocial behaviors and emotions such as cooperation, helpfulness, and empathy may have evolved in humans because they afford survival and selective advantages (Bloom, 2013; Wilson, 2015). Evidence suggests that humans orient toward prosociality, even in the absence of reciprocal benefits (Martela & Ryan, 2016). Evidently, prosociality is not only utilitarian, but also appears intrinsic to human nature (Ryan & Hawley, 2016).

Yet, despite both the biological and intrinsic benefits of behaving prosocially, there is still a dark side to human behavior. Individuals often behave in antisocial ways, such that they intentionally harm others (Berger, 2003). They can be aggressive, dominant, or malevolent. Thus, a crucial question becomes: if humans' natural, intrinsic inclinations are prosocial, what social conditions facilitate this tendency, and alternatively, what factors undermine it, or even potentiate antisocial behaviors?

Ryan and Deci (2017) recently proposed a parsimonious, albeit partial, account of these processes using the framework of *self-determination theory* (SDT). Based on SDT and recent empirical findings stemming from it, they postulated that *experiences of autonomy* support the internalization of healthy social norms, and thus bolster humans' natural tendencies toward prosociality, while *experiences of control* undermine these processes and produce antisociality. Social contexts that support individuals' experiences of autonomy are characterized by providing opportunities for perspective taking, consideration of the person's interests or needs, support for choice and volition, and the provision of rationales for requests or demands (e.g., Patall et al., 2018). Controlling contexts, in contrast, are those in which people are pressured toward specific outcomes using external contingencies, controlling language (e.g., "must" and "should"), or suppression of choice and volition. When the degree of autonomy support in the environment is high, or is manipulated to be high, people feel more autonomy satisfied, and experience more autonomously motivated states. Thus, indices of autonomy support, autonomy satisfaction, and autonomous forms of motivation all reflect experiences of autonomy (Ryan & Deci, 2017).

Within SDT, experiences of autonomy lead to prosociality because they facilitate individuals' intrinsic prosocial propensities (Ryan & Hawley, 2017; Warneken & Tomasello, 2008) and foster the internalization of positive social values (e.g., Bureau & Mageau, 2014; Brambilla, Assor, Manzi & Regalia, 2014). Experiences of autonomy also allow individuals to better align their behavior with their personal values and sentiments (Di Domenico et al., 2013; Sheldon et al., 2005), which under most conditions tend to be prosocial (Ryan & Deci, 2017). Conversely, psychological control leads to impoverished internalization, defensiveness, and compartmentalization, which can compromise the self-regulatory capacities that help inhibit antisocial impulses (e.g., Bindman, Pomerantz & Roisman, 2015; Joussemet et al., 2005). Thwarted autonomy and experiences of control can also potentiate compensatory efforts to reclaim a sense of control, often in the form of rebellion and hostility, and manifest as antisocial cognitions and behaviors (e.g., Aeleterman, Vansteenkiste & Haerens, 2019; Hawley, Little, & Pasupathi, 2002).

However, existing evidence for these relationships has been both scattered and mixed. Thus, the universally important question of whether providing individuals with autonomy and limiting control affects prosocial and antisocial behavior needs to be tested meta-analytically. In the present review, we examine this primary question: whether autonomy and control lead to prosociality and antisociality. Below we outline the theoretical mechanisms underpinning our hypotheses and provide evidence-based justifications for our predictions that experiences of autonomy are linked with increased prosociality, whereas experiences of control are linked with greater antisociality. We then test our hypotheses via a meta-analysis, using state-of-the-art two-stage structural equation modelling (Cheung, 2015), before highlighting evidence gaps and issues that need to be addressed in future research.

Autonomy, Control, and Internalization

Experiences of autonomy and control are relevant and consequential across multiple domains—from home (Bernier, Carlson, & Whipple, 2010), to school (Kanat-Maymon, Benjamin, Stavsky, Shoshani, & Roth, 2015), to the workplace (Dagenais-Desmarais & Courcy, 2014), within close relationships (Deci, La Guardia, Moller, Scheiner, & Ryan, 2006), in team sports (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011), in musical performance (Evans & Liu, 2019), as well as physical activity (Cheon, Reeve & Song, 2019) and health (Gillison et al., 2019), among others. Several studies have directly linked autonomy-supportive and controlling environments with prosocial and antisocial outcomes (Joussemet, Koestner, Lekes, & Landry, 2005; Joussemet, Mageau, & Koestner, 2014; Miklikowska, Duriez, & Soenens, 2011; Roth, Kanat-Maymon, & Bibi, 2011; Vansteenkiste, Soenens, Van Petegem, & Duriez, 2014). Yet, few have offered a theory-based explanation for these links. Therefore, before outlining the empirical evidence supporting our hypotheses, we first describe the relevant theory anchoring our claims.

SDT argues that experiences of autonomy allow people to grow and integrate, to healthily attach to others, and to internalize proximal social values and attitudes (Ryan & Deci, 2017). The theory acknowledges the selective advantages of evolved capacities such as those for aggression, dominance, and acquisitiveness. However, SDT argues that experiences of autonomy support the higher-order self-regulatory systems that down-regulate antisocial capacities in favour of prosocial ones by promoting *internalization* and, ultimately, *integration*. Internalization refers to humans' natural tendency to take in ambient values and norms (Ryan & Deci, 2000). However, for a value to become fully *integrated*, individuals need to be able to mindfully process and wholly endorse the value and any behaviors it manifests (Donald et al., 2019; Ryan & Deci, 2017).

SDT's *motivation* continuum also reflects the internalization process, wherein varieties of motivation are distinguished by their degree of autonomy or control. Within SDT, the most autonomous form of motivation is *intrinsic motivation*, wherein actions are enjoyed in and of themselves. Other autonomous forms of extrinsic motivation include *identification* and *integration*, wherein people are acting in line with their values and wholly endorse their actions. Controlled forms of extrinsic motivation include *introjection* (experiences of internal pressure like guilt and shame) and *external regulation* (overreliance on contingent rewards and sanctions). SDT proposes that autonomy-supportive environments lead to forms of motivation that reflect autonomy, while controlling contexts precipitate controlled motives which undermine the internalization process (e.g., Laurin & Joussemet, 2017).

Because adaptive social norms are typically more prosocial than aggressive, processes of internalization support more positive social outcomes (Vansteenkiste & Ryan, 2013). While individuals can internalize antisocial values too, evidence suggests that people not only suffer when they harm others, but they also tend not to stand behind their antisocial actions, often attributing the cause to factors external to the self (Legate et al., 2013). This suggests antisocial values are not integrated: they are seldom made coherent with other elements of the self. Thus, autonomy-supportive environments, which are reflected in both autonomy satisfaction and autonomous motivations, facilitate prosociality via the internalization process. In contrast, controlling environments frustrate basic psychological needs, and when prolonged or intense, result in poorer internalization, more defensiveness, reactivity and even oppositional defiance (Ryan, Deci & Vansteenkiste, 2016).

Evidence Linking Experiences of Autonomy and Control with Prosociality and Antisociality

As noted above, several studies within SDT have examined the relations between experiences of autonomy and/or control, and prosocial and antisocial outcomes (e.g., Joussemet, et al. 2014; Vansteenkiste et al. 2014; Weinstein & Ryan, 2010). For example, Hodge and Lonsdale (2011) reported that autonomy-supportive coaching styles were associated with greater prosocial behaviors among teammates, a result mediated by the athletes' autonomous motivation. As another example, Assor, Feinberg, Kanat-Maymon and Kaplan (2018) reported on a 22-month-long program to enhance teachers' autonomy support. Results comparing intervention and control schools suggested that the program fostered more caring among students, as well as lower violence. Exemplifying findings on the controlling side of the ledger, Joussemet and colleagues (2008) tracked trajectories of aggressive behavior in children aged 6-12. Although children generally became less aggressive with age, mothers whose parenting practices were more controlling had children whose trajectory of aggression remained highest, even when controlling for other risk factors. Van der Kaap-Deeder and colleagues (2019) studied Belgian prisoners and found positive associations between the controlling style of correctional officers and inmate reported aggression. Taken together, such varied studies suggest that the degree to which people experience autonomy or control may play a role in the prosocial and antisocial outcomes, across domains.

Although associations between autonomy, control, prosociality, and antisociality have been studied in specific contexts, to date there has been no meta-analytic examination of these links. In fact, studies can be found that report positive (e.g., Cheon et al., 2019; Martela et al., 2016), negative (e.g., Jungert et al., 2016; Wu et al., 2013), and no effect (e.g., Ho et al., 2018; Delrue et al., 2017) of autonomy on prosocial outcomes. Similarly, there have been differing results regarding the effects of control on prosocial and antisocial outcomes (e.g., Chan et al., 2015; Haerans et al., 2015). Therefore, a meta-analytic test of these effects is now necessary.

Specific Hypotheses

Hypothesis 1: *Experiences of autonomy have a positive association with prosocial outcomes.*

The first hypothesis is based on the theory and evidence reviewed above concerning the facilitating effects of experiences of autonomy on prosocial outcomes. We argue that both developmental, domain-general, and situational experiences of autonomy relate positively with prosociality because these experiences support individuals' intrinsic tendencies to be prosocial by facilitating the internalization of adaptive social values and norms.

Hypothesis 2: *Experiences of autonomy have a small, negative association with antisocial outcomes.*

Underpinning our second hypothesis is that we anticipate a largely *dual-process effect* of autonomy and control on prosocial and antisocial outcomes, respectively (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015; Jang, Kim, & Reeve, 2016; Vansteenkiste & Ryan, 2013). The dual-process model treats autonomy and control as distinct constructs, rather than as opposing ends of a polar spectrum (e.g., Bhavsar et al., 2019; Duineveld et al. 2020; Jang, Kim, & Reeve, 2016; Li, Deng, Wang, & Tang, 2018). This is a central notion within SDT, wherein autonomy and control represent distinct motivational experiences that can co-occur, alternate, or both be absent (Ryan & Deci, 2000; 2017). There is considerable empirical evidence for the bi-factor formulation (e.g., Bartholomew et al., 2011; Duineveld et al., 2017; Gillet et al., 2012; Haerens et al., 2015; Jang et al., 2016; Li et al., 2018; Vansteenkiste & Ryan, 2013; Vertsuyf et al., 2013).

Further, SDT claims that experiences of autonomy lead to wellness, vitality and engagement across domains, while experiences of control lead to stress, pressure and disengagement—yielding dual-process effects (Ryan & Deci, 2000). There is evidence for this, with several studies finding that autonomy leads predominantly to positive (rather than negative) outcomes, such as engagement and well-being, whereas psychological control is linked more strongly with negative (as opposed to positive) outcomes such as ill-being and disengagement (e.g., Bartholomew et al., 2011; Haerens et al., 2015; Gillet et al., 2012; Jang et al., 2016; Li et al., 2018; Vertsuyf et al., 2013). Based on this rationale, we anticipate that experiences of autonomy will primarily relate to prosocial outcomes (positively), and that experiences of control will primarily relate to antisocial outcomes (also positively).

The dual-process model also suggests that crossover effects may be present but will be smaller. Indeed, existing evidence suggests that experiences of autonomy may have mixed or moderately negative associations with antisocial outcomes (e.g., Brauer et al., 2017; Mallia et al., 2019; Roth et al., 2011; Vansteenkiste et al., 2009), while control has been shown to have moderate associations with prosociality (e.g., Ho et al., 2018; Jiang et al., 2016; Mouratidis et al., 2019; Rueth et al., 2017).

Following from the theoretical rationale articulated above, we expect that experiences of autonomy are not conducive to antisocial outcomes, but they do not actively suppress those outcomes. As an example, autonomy-supportive teaching practices have been linked with less student cheating in both school and university students (Kanat-Maymon et al., 2015; Roth et al., 2011). Similarly, an atmosphere of autonomy support played a protective role in school violence and bullying (Roth et al., 2011). One explanation for these effects is that autonomy-supportive contexts are less likely to activate extrinsic motives for behavior, such as those shaped by external rewards or punishments. Without those motives, expedient or unethical goal-directed behavior is less useful (Ryan & Deci, 2017). Reducing extrinsic motives tends to reduce antisocial behavior, with moderate effect sizes (Kasser et al., 2014; Cheon et al., 2018; Hadden et al., 2018; Mallia et al., 2019). Again, however, some studies report conflicting results, finding no association between autonomous motivation and antisocial outcomes, or even a positive association. For example, in a study of employees in the Netherlands, Kalshoven, van Dijk and Boon (2016) did not find evidence that autonomy in one's job reduced unethical behaviors, though job autonomy was positively associated with ethical leadership. Such findings highlight the need to focus a meta-analytic lens on the account outlined above.

Hypothesis 3: *Experiences of control have a positive association with antisocial outcomes.*

Many factors lead to antisocial outcomes, and research within SDT has demonstrated that autonomy and control play differential roles in promoting antisociality (Ryan & Deci, 2017). As articulated above, experiences of psychological control can both hamper internalization and lead to antisocial compensatory acts to reclaim autonomy. For example, in a study of psychological control in the family context, Vansteenkiste et al. (2014) found that parents who communicated moral values in a controlling way had children who became defiant and resisted those values. Bureau and Mageau (2014) found that the children of controlling parents valued honesty less, and indeed had more motivation to hide the truth, which might be costly in a judgmental, controlling context.

More direct examples of the link between control and antisociality have also appeared. Mothers' who self-reported controlling parenting attitudes had children who were more physically aggressive in elementary school (Joussemet et al., 2005). Among Cypriot adolescents, Fousiani et al. (2016) found that psychological control by parents directly predicted cyber-bullying. Parental autonomy support indirectly reduced cyber-bullying, via increased satisfaction of adolescents' need for autonomy, which predicted more empathic concern towards others and recognition of humanness. In longitudinal research, Joussemet et al. (2014) demonstrated that as parents decreased their use of controlling language over time, their children's externalizing behaviors decreased. In a domain such as parenting, the link between control and antisociality is especially important to highlight because, as Grolnick (2009) points out, controlling parents often have good intentions. Yet, such intentions appear not to protect against the antisocial effects of control.

The effects of controlling contexts on antisocial outcomes are also evident well beyond the home. In a study of Estonian schools, Hein, Koka, and Hagger (2015) found that controlling teacher behaviors resulted in both antisocial emotions (i.e., anger) and behaviors (i.e., bullying) in children. In Belgian schools, Haerens et al. (2015) showed that controlling teaching lead to more student oppositional defiance. Among Israeli undergraduates, Kanat-Maymon et al. (2015) found that thwarting individuals' autonomy resulted in more cheating. In the domain of sport, Hodge and Gucciardi (2015) found that controlling coaching and team climates were associated with antisocial behaviors, whereas autonomy-supportive coaching and team climates predicted need satisfaction and prosocial behaviors. In the workplace, Bureau et al. (2018) reported three studies, all showing that employees in less autonomy-supportive work contexts engage in higher levels of organizational deviance. Taken together, this evidence lends support to our hypothesis that across varied social contexts characterized by experiences of control, individuals will be more likely to resort to unethical, amoral, and other antisocial outcomes.

Hypothesis 4: *Experiences of control have a small, negative association with prosocial outcomes.*

In addition to increasing antisocial outcomes, psychological control may also *decrease* prosocial outcomes. For example, evidence suggests that controlling teaching practices predict less prosocial behavior among Korean students (Cheon et al., 2019). Likewise, in a study of customers at a not-for-profit performing arts center in the U.S., using extrinsic rewards (e.g., gaining special access to performances and exhibits) predicted less willingness to contribute to the center (Johnson et al., 2010). However, studies have also found that controlled motives have no effect (Jiang et al., 2016; Salinas et. al., 2017; Vanskeenkiste et al., 2014) or even a positive effect on prosociality (Chan et al., 2017; Pentecost et al., 2017). These latter findings may be because, in some contexts, relatively extrinsic motivations (e.g., persistence toward goals such as performance on a project) may bring with them prosocial outcomes (e.g., more helping behavior in project teams). Therefore, consistent with the dual-process model we propose, we expect the crossover association between control and prosociality to be negative, but modest in size.

Hypothesis 5: *Experiences of autonomy and control have largely independent effects on prosociality and antisociality, respectively.*

SDT proposes that autonomy and control are independent constructs, rather than two ends on a continuum (Ryan & Deci, 2017). Individuals may use autonomy-supportive strategies, controlling strategies, or a mixture of both, depending on the social context and personality factors. Consistent with this prediction, experiences of parental autonomy support and control have been found to be only moderately correlated (Duineveld et al., 2018). An advantage of the two-stage structural equation modelling approach used in the present study (TSSEM; Cheung, 2015), is that it enabled us to assess the extent to which the associations between autonomy and prosociality, and control and antisociality, are *independent* of the other motivational style—which would be consistent with SDT—or *co-dependent*. For example, the finding of an association between autonomy and prosociality that is not also a function of control, would mean that the (positive) links between autonomy and prosociality are *not* also a function of the (negative) association between control and prosociality. This, in-turn, has practical implications for interventions: interventions are unlikely increase prosocial outcomes if they reduce psychological control (e.g., minimizing the use of controlling language and behaviors) without explicitly increasing autonomy (e.g., the use of rationales and providing choice).

On the other hand, if the association between autonomy and prosociality is also a function of controlled motivations (i.e., co-dependence), autonomy support interventions should simultaneously *reduce* psychological control. The TSSEM approach enables us to explore these questions, by running a simultaneous meta-analytic model. In other words, while each path (for example, from autonomy to prosociality) will be assessed individually, the path will also be examined whilst statistically controlling for the role of control in the simultaneous model, thus, isolating the independent effect of autonomy on prosociality.

Hypothesis 6: *The effects of autonomy and control on both prosocial and antisocial outcomes will be consistent across cultural, age, and gender categories.*

One of the central claims of SDT is that the beneficial effects of autonomy, and the detrimental effects of control, are universal (Ryan & Deci, 2017). Within SDT, autonomy is described as a *basic* psychological need, with the satisfaction of the need for autonomy seen as fundamental to human thriving across contexts. A central objective of the present review was to test whether the effects of autonomy and control on both prosocial and antisocial outcomes are consistent across contexts, or whether, instead, these effects vary as a function of the context. Whereas constructs such as independence, separateness, and individualism vary across cultures and contexts, autonomy is viewed within SDT as a fundamental psychological nutriment that exists distinct from these factors (notwithstanding the common tendency within psychology to conflate autonomy with these other constructs; see Ryan & Deci, 2017; Soenens, Vansteenkiste & Van Petegem, 2015).

Considerable evidence supports the universal value of autonomy for human functioning. For example, Chirkov, Ryan, Kim, and Caplan (2003) found that autonomous motivations for cultural practices predicted well-being among Russian, Turkish, South

Korean and U.S. samples, independent of the specific cultural practices individuals engaged in; and across genders. In another study, Chen et al (2013) found that autonomy (but not independence) predicted indices of well-being in a Chinese sample. Further, studies have found that experiencing autonomy is associated with healthy social functioning across the developmental spectrum, for example, in infancy (Bernier, Castle, & Whipple, 2010), in early primary school (Piotrowski, Lapierre and Linebarger (2013), and in high school (Vansteenkiste, Sierens, et al., 2012). Based on this theorizing and evidence, we expect that individuals' prosocial tendencies will be enhanced in environments that support experiences of autonomy (and thwarted in controlling contexts), irrespective of the individuals' cultural background, age, or gender.

The Present Review

This systematic review assembled the available evidence on the associations between autonomy and control, and both prosociality and antisociality, across a diverse range of study contexts and samples. We conducted a series of meta-analyses, providing a multi-method test of our hypotheses (i.e., drawing on correlational, longitudinal, and experimental evidence to test our predictions). We did so by first running a series of 'single-path' meta-analyses (see the single-arrow paths in Figure 1), and then combined these into a single model, using the TSSEM method. Our theoretical model is illustrated in Figure 1.

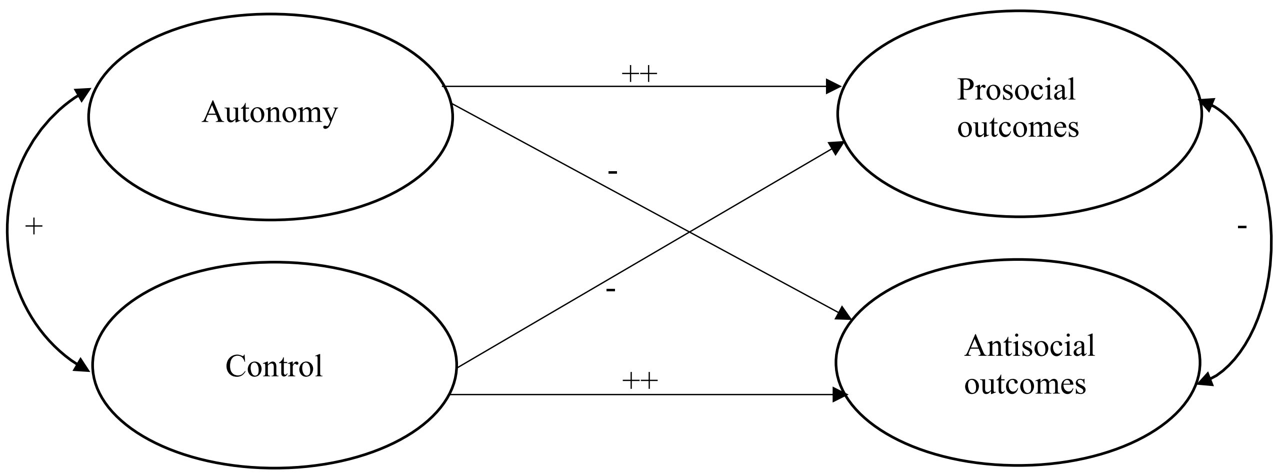

Figure 1. Theoretical model linking experiences of autonomy and control with prosocial and antisocial outcomes.

Method

Eligibility criteria

In the present review, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement as a guide (http://www.prismastatement.org/). Studies were eligible for inclusion in this review if they a) included a measure or manipulation of either autonomy support, autonomous motivation, or autonomy satisfaction, or of control or controlled motivation and b) included a measure of prosocial or antisocial behavior, affect, or cognition (below is a more detailed description of our eligibility criteria for both sets of variables). Further, only studies written in English, and that included quantitative analyses, were included in the review. We did not impose restrictions on participant characteristics (e.g., age, gender, occupation or nationality), or publication status—including both published and unpublished datasets.

Experiences of Autonomy

We included three manifestations of experiences of autonomy: self-reports or direct manipulations of autonomy support, and self-reports of experiencing either autonomy need satisfaction or autonomous motivation. First, we included direct reports of receiving autonomy support within one's social environment. This included measures where people explicitly described the degree of autonomy support in various social contexts, for example: their healthcare professionals (Health Care Climate Questionnaire; Williams, Gagné, Ryan & Deci; 2002), teachers (Learning Climate Questionnaire; Black & Deci, 2000), or parents (Perceived Parental Autonomy-Support Scale; Mageau et al., 2015).

Second, we included any intervention or induction designed to enhance experiences of autonomy. These included interventions designed to increase autonomy support over the long-term (e.g., autonomy-supportive parenting programs) and inductions designed to manipulate autonomy over the short-term (e.g., via the use of more autonomy-supportive language).

Finally, because autonomy need satisfaction and autonomous forms of motivation emerge directly from autonomy-supportive social contexts, these constructs are also considered indicative of experiences of autonomy in this review. As such, we included measures where people described how much autonomy satisfaction they felt, either in a specific social context (e.g., Basic Needs Satisfaction in Sport Scale; Ng, Lonsdale, & Hodge, 2011) or generally (e.g., Basic Psychological Needs Scale; Liga et al., 2020). Relatedly, we included measures of autonomous motivation which, within SDT, are intrinsic and identified motivations (Ryan & Deci, 2000; 2017). As with all the assessments in this review, measures did not need to be explicitly derived from SDT. We included any measures of perceived autonomy that is consistent with the SDT definition of autonomy (e.g., Autonomy subscale of the Climate of Well-being Continuum; Geiger, 2014).

Control

As with autonomy, we included three types of exposure to controlling environments: self-reports of receiving psychological control, direct manipulations of control, and self-reported experiences of controlled motivation. As above, measures could be directly drawn from SDT or from the literature on psychological control more generally, provided the latter was definitionally consistent with SDT. Perceived control included any measure where a person described the degree to which they experienced psychological control in a particular context (e.g., Need Satisfaction and Frustration Scale; Tindall & Curtis, 2019). Manipulations typically included inductions designed to temporarily increase perceived psychological control (e.g., by using controlling language; using contingent rewards with children). Finally, measures of need thwarting included any measure that addressed the degree to which someone felt pressured or controlled, without necessarily indicating the source (e.g., Psychological Control Scale-Youth Self Report; Barber, 1996), as well as measures of controlled motivation (i.e., introjection and external motivations, such as measures of controlled goal motivation; Vansteenkiste et al., 2010).

Prosocial and antisocial outcomes

We defined prosocial behavior as "voluntary behavior intended to benefit another" (Eisenberg et al., 2007). As the preceding literature review and hypotheses suggest, we expect that autonomy (and control) will relate to prosocial outcomes that are behavioral (i.e., charitable donations), as well as cognitive (i.e., antiracism) and emotional (i.e., empathy). Objective measures of prosocial behavior included directly observable acts voluntarily undertaken to benefit others (i.e., donating to charity). Subjective prosocial behaviors included self-reported measures of behaviors such as altruism and helping behavior. Prosocial cognitions and emotions included self-report measures of care or concern for the well-being of others (i.e., empathy, sympathy, and compassion). We treat these various 'types' of outcomes (i.e., behavioral, cognitive, and emotional) en bloc in our review, and refer to them as 'prosocial outcomes'.

We defined antisocial behavior as intentional "actions that harm or lack consideration for the well-being of others" (Berger, 2003). This definition has two parts, the harm to the other, and the intention. Even if one intended to harm another, but failed, the behavior was still considered antisocial for the present purposes. As with prosocial outcomes, we expect that control (and autonomy) will relate to antisocial outcomes that are behavioral (i.e., violence), as well as cognitive (i.e., prejudice) and emotional (i.e., hate). Objective measures of antisocial behavior included observable acts that harmed another person (e.g., inflicting punishment, taking money from someone). Subjective measures included self-report measures of antisocial behavior (e.g., Youth Self Report; Ivanova et al., 2007; Dark Triad Scale; Kaufman, et al., 2019). Antisocial cognitions and emotions included self-report measures of ill-will toward others (e.g., hate, jealousy, prejudice). As we did with prosocial outcomes, we refer to antisocial behavior, cognition, and emotion together as 'antisocial outcomes'

Notably, we excluded measures of prosociality or antisociality that were indirect measures of these constructs (i.e., where the benefit or harm was not direct, such as smoking, drug use, and other health-related behaviors). We also excluded studies with purported measures of prosociality and antisociality about which there is considerable moral and ethical debate (e.g., abortion, euthanasia). In generating search terms for prosocial and antisocial outcomes, we drew on the Jonathan Haidt moral dictionary (Graham, Haidt & Nosek, 2009).

Information sources

Literature searches were conducted in the following databases: Psychological and Behavioural Sciences, SocIndex, ERIC, PsycINFO, ProQuest Psychology Journals, Web of Science, Scopus, Medline, CINAHL, and PubMed. In addition, we emailed the global listserv for SDT researchers, requesting relevant studies. As a final step, we searched for relevant studies in the reference lists of the studies identified via our initial database search and associated screening process. Our search was concluded on 1 October 2020. A complete list of our search terms and search strategy is in *Supplemental Materials*.

Study selection

Our eligibility criteria were used to select studies via title and abstract screening and full-text screening. Two researchers independently screened all studies in the review, and any conflicts were resolved either via discussion, or with input from a third member of the author team. Study screening was conducted using the Covidence software (www.covidence.org).

The full-text version of six records were unable to be located. Figure 2 shows the inclusion flow diagram. A total of 139 reports (comprising 167 studies) were included in the meta-analysis.

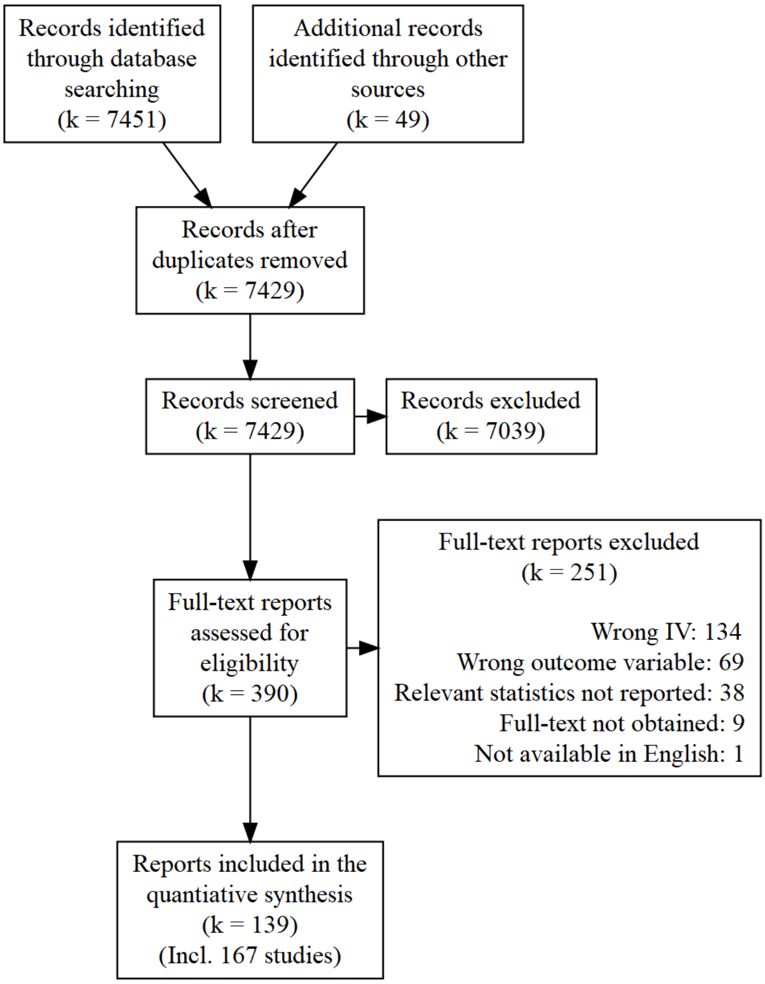

Figure 2. Flow of reports and studies into quantitative synthesis.

Data collection process

A reviewer extracted relevant data from all studies included in the review. A second reviewer then independently extracted data from a random subset of 50% of included studies. Of the 35,438 cells that were randomly checked, 35,435 (99.9%) were consistent between the first and second reviewers. The three conflicts were resolved via discussion.

Data items

Information was extracted on the following variables, where available: (1) publication author(s) and year; (2) study language; (3) description of study population (e.g., students, clinical patients, employees); (4) country(ies) in which the study was conducted; (5) sample ethnicity; (6) sample socio-economic status; (7) participant mean age; (8) proportion of the sample that was female; (9) study design (cross-sectional, longitudinal or experimental); (10) for longitudinal studies, the length of the longitudinal lag (in weeks), following recommendations from Card (2019); (11) number of participants; (12) cell-sizes (if experimental); (13) instrument used to measure or intervention to manipulate autonomy/control; (14) among correlational studies of autonomy, whether the measure of autonomy was autonomy support, autonomy need satisfaction, or autonomous motivation; (15) instrument used to measure prosocial/antisocial outcome/s; (16) for measures of prosocial/antisocial behavior, whether the behavior was self- or other-reported; and (17) the statistical result measuring the relationship between autonomy support/control and prosocial/antisocial outcome/s.

Study quality assessment for individual studies

Given the combination of cross-sectional, longitudinal, and experimental studies, a typical risk of bias assessment (e.g., RoB2; Sterne et al., 2019) would not be appropriate. We selected a series of criteria that would allow for a parsimonious assessment of some important criteria, so we created a study quality assessment using items from two sources. For all studies, we used three items from the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools). Specifically, we assessed: whether the eligibility criteria were clearly specified; whether the exposure (autonomy/control) were assessed using valid, reliable measures; and whether the outcomes (pro/antisociality) were assessed using valid, reliable measures.

For experimental studies, we also included five additional items from the Cochrane Risk of Bias tool (Higgins & Altman, 2011) and NIH Quality Assessment for Controlled Intervention Studies (https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools). Specifically, we assessed: whether the random sequence was generated adequately; whether participants were blinded; whether personnel and outcome assessors were blinded; whether there was evidence of early stopping (i.e., was the target sample size prospectively registered and achieved); and whether the data analyzed using intention to treat principles.

To assess overall quality for each study, we summed across the relevant risk of bias criteria. Using the three criteria for observational studies, we classified studies as high quality when they met all three criteria, moderate quality when meeting two criteria, and low quality for meeting fewer than two criteria. For experimental studies, we used all eight criteria and classified studies as high-quality for meeting more than six criteria, moderate quality for meeting between six and four criteria, and low quality for meeting fewer than four.

Summary measures

For correlational studies, all summary measures were converted to Pearson's *r*. For intervention studies, an odds ratio, an eta-squared statistic, or a standardized mean difference between treatment and control groups was extracted, and converted into Cohen's *d* using Rosenthal's (1991, 1994) conversion formulas. Where Pearson's *r* or Cohen's *d* could not be calculated from the information in any given study, we requested this information from the study's lead author. For three correlational effects, only standardized regression coefficients were reported, and we were unable to obtain a Pearson's *r* from the author. For these studies, we generated a proxy for Pearson's *r* using the formula provided in Peterson and Brown (2005).

Analyses

All analyses were performed using R version 3.6.1 (2019-07-05) (R Core Team, 2018). The function 'escalc' from the 'metafor' package was used to calculate effect sizes (Viechtbauer, 2010). Pearson's *r* correlations were transformed to Fisher's z for analysis. Fisher's z was transformed back to correlations in the presentation of results to enhance interpretability.

Univariate meta-analysis. Multiple effect sizes were recorded per study. We conducted three-level meta-analyses using the R package metaSEM, to account for dependencies between effect sizes (Cheung, 2014, 2015). Effect sizes which are estimated by the same research team tend to be more similar than those estimated by other researchers (e.g., due to a tendency to use common methods, instruments, and participant pools; Cheung, 2014). Accordingly, we fitted our models using the report identification number as a clustering variable. For each baseline model, pooled effect sizes and 95% confidence intervals are presented. Heterogeneity indices are presented to describe the percent of variance within ($I^2_{(2)}$), and between reports ($I^2_{(3)}$) not attributable to sampling error. (Higgins, Thompson, Deeks, & Altman, 2003; Cheung, 2014, 2014). The package msemtools was used to produce tables and figures for the univariate meta-analytic models (Conigrave, 2019).

Moderation analysis. To assess whether study features were moderators of heterogeneity, they were included as predictors in mixed-effects meta-analytic models. These models were compared to the baseline models using likelihood ratio tests. The *p* value from likelihood-ratio tests was used to assess whether the baseline model fit was significantly improved by inclusion of moderator variables (Cheung, 2015). We reported the proportion of within ($R^2_{(2)}$) and between ($R^2_{(3)}$) study heterogeneity explained by each moderator. An R^2 statistic that is statistically greater than zero indicates that the model fit improves following the inclusion of the moderator. Estimates for each level of categorical moderators were produced by constraining model intercepts to zero.

Multivariate meta-analysis. Multivariate meta-analysis was performed with two-stage structural equation modelling (TSSEM) in the metaSEM package (Cheung, 2015). Correlation matrices were extracted from each report. Where multiple correlations were extracted for a pair of variables from a single report, they were averaged using fixed effects meta-analytic models. In the first stage, this list of matrices was pooled using a random effects model. In the second stage, the pooled correlation matrix was treated as a covariance matrix in order to test the hypothesized model. In this structural equation model, antisociality and prosociality were regressed on autonomy and control. The variances of autonomy and control were fixed at one to enable model identification (Cheung, 2015). A figure for the model was produced using the semPlot package.

Risk of bias. Risk of bias was calculated by using criteria recommended in the PRISMA Statement (Liberati et al., 2009). There were different response ranges for interventions and cross-sectional studies. To enable comparisons to be made across study design, total scores were converted to an ordinal variable. Further information regarding the risk of bias criteria we used, as well as risk of bias data for each study in the meta-analysis, is in *Supplemental Material*.

Publication bias. To assess potential publication bias, we took several steps. First, we generated and inspected funnel plots. Plots with asymmetric distributions indicate the presence of publication bias. Second, we tested whether meta-analytic effects varied as a function of studies' publication status, with evidence of this indicating that effects from published studies may be inflated (Borenstein, Hedges, Higgins, & Rothstein, 2009). Third, we ran the three-parameter selection method (3PSM; Vevea & Woods, 2005). The 3PSM method has been found to be a robust sensitivity measure for publication bias relative to more traditional assessments of publication bias (e.g., Egger's regression test, rank correlation test, Trim-and-Fill; Pustejovsky & Rodgers, 2019; McShane, Böckenholt, & Hansen, 2016). It is especially advantageous for tests of publication bias among moderately-sized meta-analytic datasets, such as in the present case (Vevea & Woods, 2005). Finally, where we found evidence of potential publication bias via the above methods, we ran sensitivity analyses, estimating what the pooled effect would be in the absence of missing studies and effects, using the precision-effect test and precision-effect estimate with standard errors (PET-PEESE) method (Stanley, 2017). To do this, we calculated PET-PEESE models in meta-SEM. We used the standard error of the effect size as a predictor (PET) and tested for statistical significance. If the standard error was a significant predictor of the effect size, the sampling variance was used instead (PEESE). This procedure resulted in the pooled estimate being adjusted for any correlation between the effect size and effect variance (Stanley & Doucouliagos, 2014).

Results

A table of effect sizes and other study-specific information, from each study included in this review, appears in *Supplemental Materials*. Due to the methodological and inferential differences between correlational and intervention studies, we report results from both sets of studies separately in the following sections. We evaluate the magnitude of our effects according to recent evidence from Gignac and Szodorai (2016) and Funder and Ozer (2019). Gignac and Szodorai (2016) examined the 25th, 50th, and 75th percentiles of 708 meta-analytic effect sizes, reporting that these thresholds corresponded to correlations of 0.11, 0.19, and 0.29, respectively. They concluded that correlations in the range of 0.10 are relatively small, 0.20 are typical, and those approaching 0.30 are relatively large. Similarly, Funder and Ozer (2019) conducted a review of psychological research, finding that effects approximating 0.05 are very small, 0.10 are small, 0.20 is a medium-sized effect, and 0.30 is a large effect (in terms of the consequences of each effect size on a single event).

Correlational evidence

A total of 134 reports (160 studies; 1,160 effects) contained correlations—both cross-sectional and longitudinal—between variables of interest. Of these reports, 124 were published, and 10 were unpublished dissertations. These reports comprised N = 70,175 individuals. Of the included reports, 22 (79 effects) included autonomy support as the predictor, 54 reports (141 effects) included indices of autonomous motivation, and 11 reports (27 effects) included self-reports of autonomy satisfaction.

Autonomy and prosociality. Seventy-four reports (85 studies; 247 effects) included data on the association between experiences of autonomy and prosociality. As Table 1 shows, the pooled effect size was r = 0.28, 95% CI [0.24, 0.32]. The within-report heterogeneity was 60.06%. The between-report heterogeneity was 36.29%. The only variable that statistically significantly moderated the pooled effect was 'Autonomy type', which consisted of three categories: (a) autonomous motivation; (b) autonomy satisfaction; and (c) autonomy support. While the effects were positive and statistically significant for all three experiences of autonomy, the effects were larger for autonomous motivation than they were for autonomy support. As evidence for the directionality of the association between autonomy and prosociality, the pooled effect-size among longitudinal studies was statistically significant and medium-sized (r = 0.25 [0.16, 0.34]). Further, we found a large effect among longitudinal reports that controlled for baseline levels of prosociality (r = 0.50, 95% CI [0.41, 0.59]), which provides evidence that autonomy *precedes* changes in prosociality over time. We further note that the pooled longitudinal effect did not vary as a function of differences in the length of the longitudinal lag in each of these studies (ranging from 2 to 104 weeks; $R^2_{(2)}$

= 0.02; $R^2_{(3)}$ = 0.00; p value = 0.99). Figure 3 displays a forest plot of studies examining the link between autonomy and prosociality, organized by date of publication. Notably, effects are relatively consistent across the span of years in which studies were published.

Table 1

Meta-analytic association between experiences of autonomy and prosocial outcomes

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Baseline ($I^2_{(2;3)}$: 0.60; 0.36)	74	247	0.28 [0.24, 0.32]	0.29	0.02	-	-	-
Region	69	232	-	-	-	0.01	0.16	1.00
Age	45	128	-	-	-	0.01	0.25	1.00
Gender	70	238	-	-	-	0.01	0.00	1.00
Autonomy type	74	247	-	-	-	0.02	0.19	.004*
Autonomous motivation	54	141	0.32 [0.27, 0.36]	0.33	0.02	-	-	-
Autonomy satisfaction	11	27	0.26 [0.16, 0.36]	0.27	0.06	-	-	-
Autonomy support	22	79	0.18 [0.11, 0.25]	0.18	0.04	-	-	-
Report type	74	246	-	-	-	0.00	0.00	1.00
Behavior reporter	10	25	-	-	-	0.00	1.00	1.00
Longitudinal	74	246	-	-	-	0.00	0.00	1.00
Lag type	7	31	-	-	-	0.08	1.00	1.00
Follow up length	7	43	-	-	-	0.02	0.00	1.00
Risk of bias	72	244	-	-	-	0.00	0.01	1.00
Published	73	246	-	-	-	0.00	0.06	0.33

Note. * $p < 0.05$; $I^2_{(2;3)}$ = Within- and between-report heterogeneity, respectively. k = number of clusters (reports). n = number of estimates. $R^2_{(2)}$ = the proportion of within-report heterogeneity explained by the covariate. $R^2_{(3)}$ = the proportion of between-report heterogeneity explained by the covariate. p = Likelihood ratio p-value, significant values demonstrate that the addition of the moderator significantly improved model fit. Estimate = Fischer-z transformed correlation; r = Pearson correlation. Report type = whether prosociality was self- or other-reported. Behavior reporter = whether prosociality was reported by parents, teachers, co-workers, or researchers. Lag type = whether longitudinal correlations controlled for baseline levels of the outcome. Follow up length = Measurement lag measured in weeks.

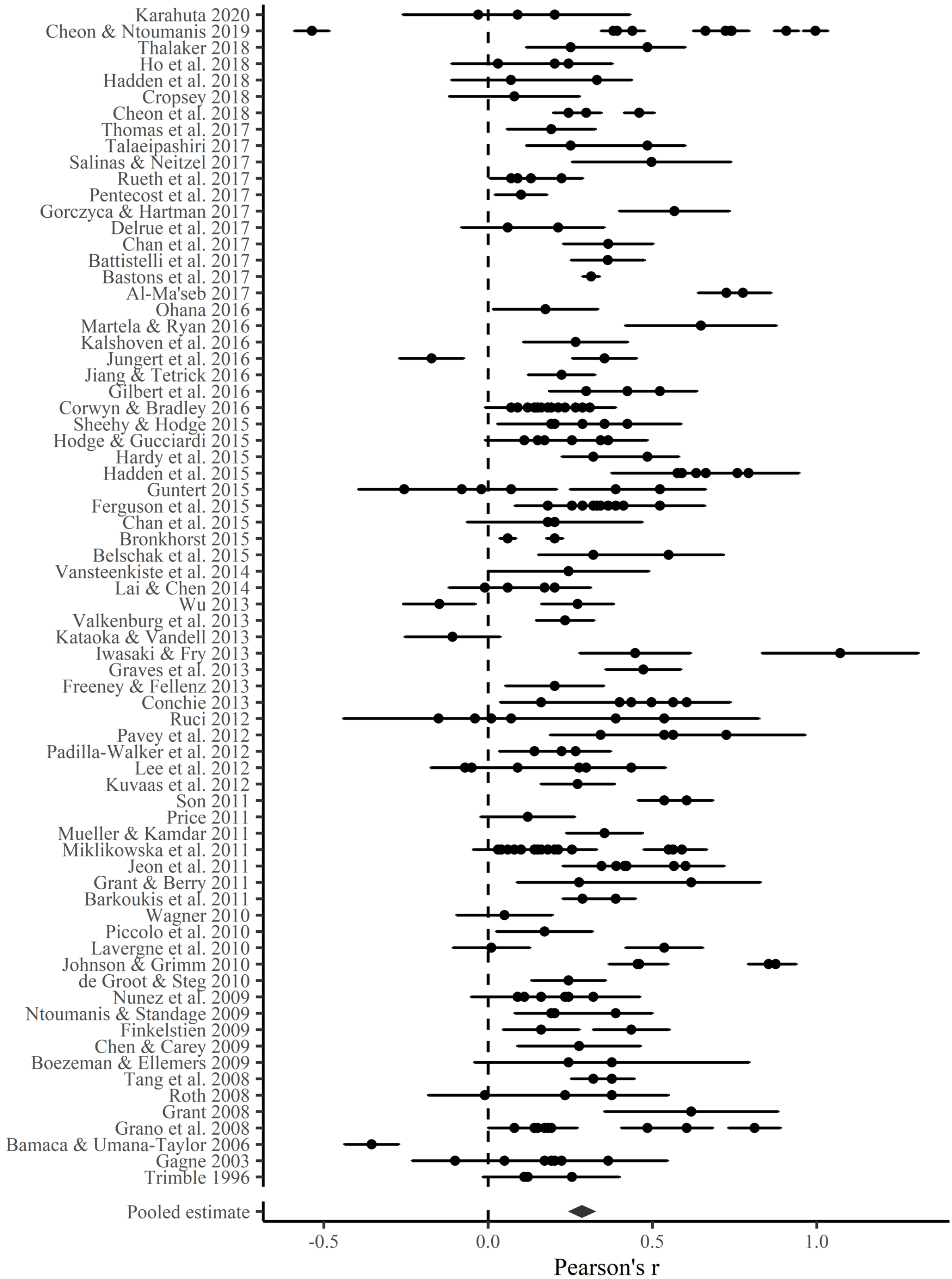

Figure 3. Forest plot of the association between experiences of autonomy and prosocial outcomes. *Note.* Each data-point and confidence interval represents an effect within a study.

Autonomy and antisociality. Sixty-nine reports (84 studies; 249 effects) contained data that could be pooled. The pooled effect size was -0.08 [95% CI -0.13, -0.03]. The within-report heterogeneity was 26.88%. The between-report heterogeneity was 69.88%. The covariate that significantly moderated the baseline model was 'Age'. The differences between the three age group categories were not statistically significant, nor were estimates for each category different from zero. Significant moderation in this case indicates that the model is improved via the inclusion of age-related information. Moderation analyses are presented in Table 2. Figure 4 shows a forest plot of included effect sizes for this pair of variable. Effect-sizes are relatively consistent across years, notwithstanding one outlier (Goldstein et al., 2008).

Table 2

Meta-analytic association between experiences of autonomy and antisocial outcomes

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Baseline ($I^2_{(2;3)}$: 0.27; 0.70)	69	248	-0.08 [-0.13, -0.03]	-0.08	0.03	-	-	-
Region	67	237	-	-	-	0.00	0.11	1.00
Age	42	164	-	-	-	0.00	0.05	0.69
Gender	65	233	-	-	-	0.02	0.00	1.00
Autonomy type	68	244	-	-	-	0.00	0.00	1.00
Report type	69	247	-	-	-	0.00	0.00	1.00
Behaviour reporter	11	22	-	-	-	0.16	0.00	1.00
Longitudinal	69	248	-	-	-	0.01	0.00	0.54
Lag type	7	20	-	-	-	0.00	0.00	1.00
Follow up weeks	7	20	-	-	-	0.01	0.00	1.00

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Risk of bias	67	236	-	-	-	0.00	0.17	1.00
Published	69	248	-	-	-	0.00	0.01	0.48

Note. * $p < 0.05$; $I^2_{(2;3)}$ = Within- and between-report heterogeneity, respectively. k = number of clusters (reports). n = number of estimates. $R^2_{(2)}$ = the proportion of within-report heterogeneity explained by the covariate. $R^2_{(3)}$ = the proportion of between-report heterogeneity explained by the covariate. p = Likelihood ratio p-value, significant values demonstrate that the addition of the moderator significantly improved model fit. Estimate = Fischer-z transformed correlation; r = Pearson correlation. Autonomy type = whether autonomy was autonomous motivation, autonomy satisfaction, or autonomy support. Report type = whether prosociality was self- or other-reported. Behavior reporter = whether prosociality was reported by parents, teachers, co-workers, or researchers. Lag type = whether longitudinal correlations controlled for baseline levels of the outcome. Follow up length = Measurement lag measured in weeks.

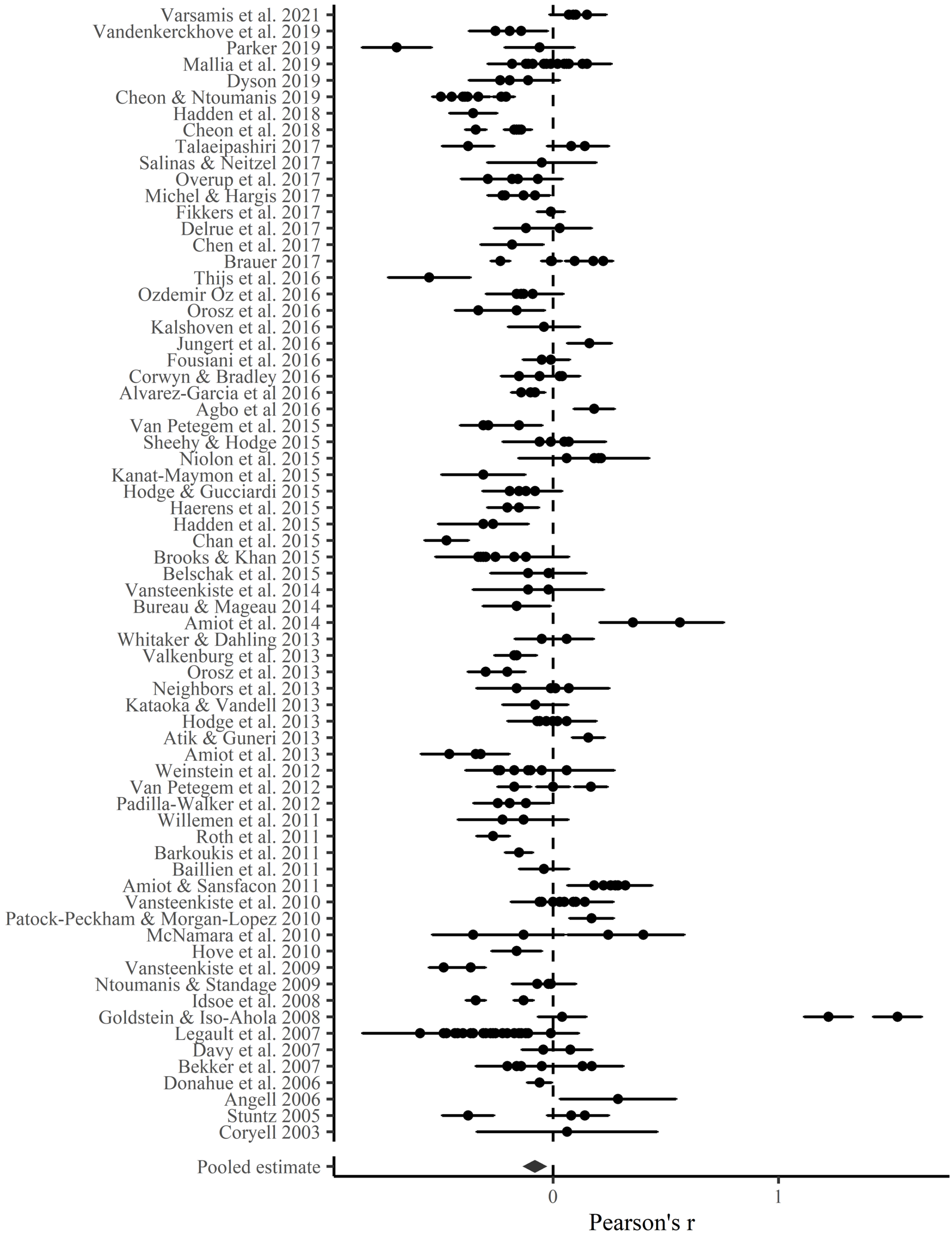

Figure 4. Forest plot of the association between experiences of autonomy and antisocial outcomes.

Control and antisociality. Fifty-four reports (64 studies; 222 effects) contained data that could be pooled. The pooled effect-size was *r* = 0.16 [95% CI 0.12, 0.21]. The within-report heterogeneity was 46.27%; between-report heterogeneity was 49.27%. The meta-analytic result did not vary whether antisociality was self- or other-reported. The covariate that significantly moderated the baseline model was 'Longitudinal'. Cross-sectional effects were small-to-medium-sized (*r* = 0.18 [0.13, 0.22]), while longitudinal effects were non-different from zero (*r* = 0.02 [-0.10, 0.14]). Among longitudinal studies (5 reports, 18 effect sizes), effects did not vary as a function of the length of the longitudinal lag across studies. Moderation analyses are presented in Table 3.

Table 3

Meta-analytic association between control and antisocial outcomes

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Baseline ($I^2_{(2;3)}$: 0.46; 0.49)	54	222	0.16 [0.12, 0.21]	0.16	0.02	-	-	-
Region	50	208	-	-	-	0.00	0.38	1.00
Age	33	148	-	-	-	0.00	0.13	1.00
Gender	53	219	-	-	-	0.00	0.01	1.00
Report type	54	222	-	-	-	0.00	0.00	1.00
Behaviour reporter	11	27	-	-	-	0.48	0.78	1.00
Longitudinal	54	222	-	-	-	0.09	0.00	.008*
No	51	204	0.17 [0.13, 0.22]	0.18	0.03	-	-	-
Yes	5	18	0.02 [-0.10, 0.13]	0.02	0.06	-	-	-
Lag type	5	18	-	-	-	0.00	0.04	1.00
Follow up weeks	5	18	-	-	-	0.00	0.02	1.00
Risk of bias	52	210	-	-	-	0.00	0.09	1.00

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Published	54	222	-	-	-	0.00	0.00	0.90

Note. * p < 0.05; $I^2_{(2;3)}$ = Within- and between-report heterogeneity, respectively. k = number of clusters (reports). n = number of estimates. $R^2_{(2)}$ = the proportion of within-report heterogeneity explained by the covariate. $R^2_{(3)}$ = the proportion of between-report heterogeneity explained by the covariate. p = Likelihood ratio p-value, significant values demonstrate that the addition of the moderator significantly improved model fit. Estimate = Fischer-z transformed correlation; r = Pearson correlation. Report type = whether prosociality was self- or other-reported. Behaviour reporter = whether antisociality was reported by parents, teachers, co-workers, or researchers. Lag type = whether correlations across time controlled for baseline relationships. Follow up weeks = Measurement lag measured in weeks.

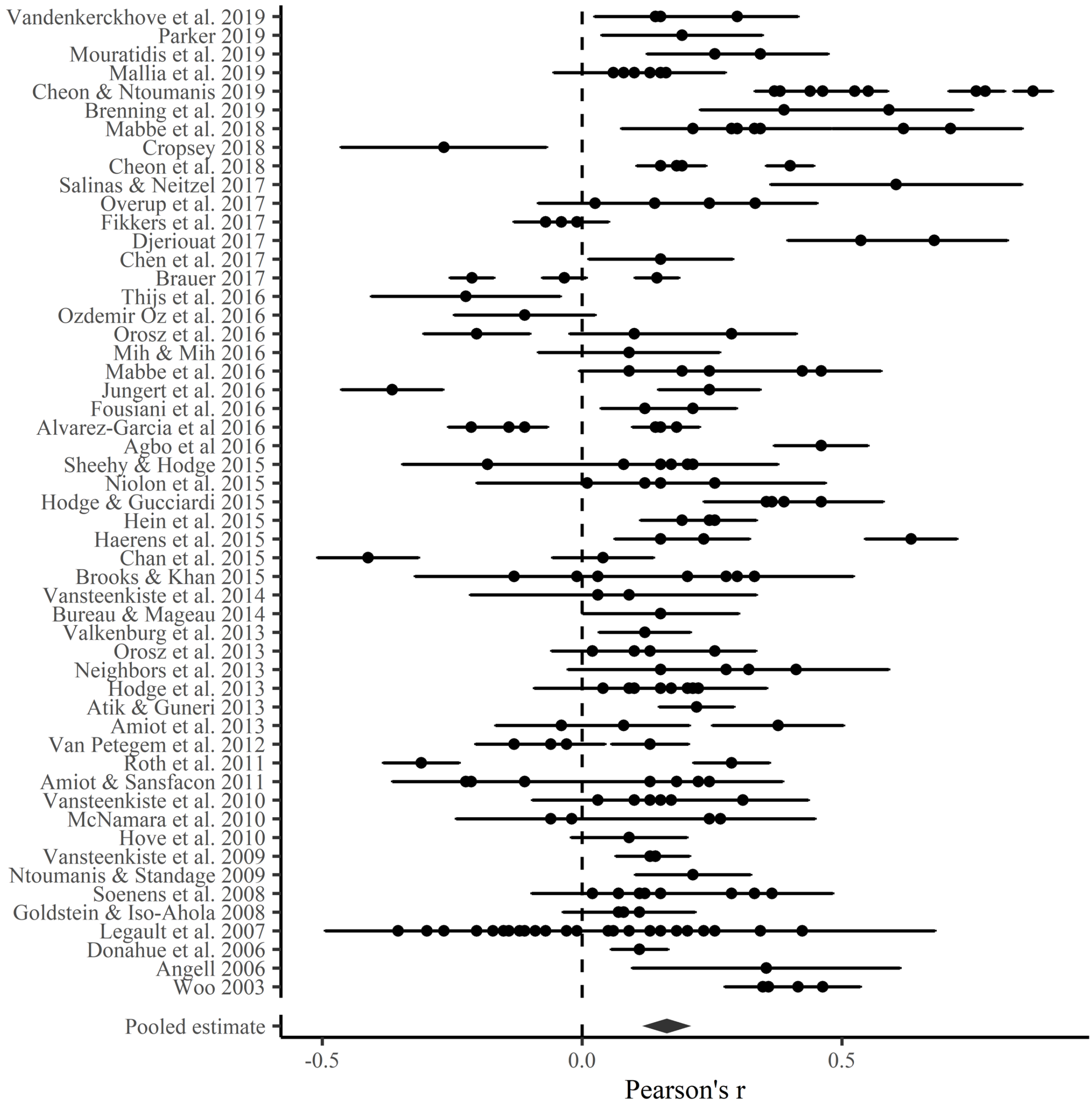

Figure 5. Forest plot of the association between control and antisocial outcomes.

Control and prosociality. Forty reports (43 studies; 146 effects) contained data that could be pooled. The pooled effect size was r = 0.05 [95% CI -0.01, 0.10]. The within-report heterogeneity was 49.06%; between-report heterogeneity was 46.76%. No covariate was found to be a statistically significant moderator of the baseline model. Moderation analyses are presented in Table 4.

Table 4

Meta-analytic association between control and prosocial outcomes

Moderator	k	n	r [95% CI]	Estimate	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Baseline ($I^2_{(2;3)}$: 0.51; 0.46)	40	146	0.05 [-0.01, 0.10]	0.05	0.03	-	-	-
Region	36	138	-	-	-	0.01	0.00	1.00
Age	23	68	-	-	-	0.05	0.00	1.00
Gender	38	143	-	-	-	0.02	0.07	0.14
Control type	5	16	-	-	-	0.00	0.07	1.00
Behaviour reporter	4	6	-	-	-	0.00	0.00	1.00
Report type	40	146	-	-	-	0.00	0.00	1.00
Longitudinal	40	146	-	-	-	0.00	0.07	0.50
Lag type	7	28	-	-	-	0.00	0.89	1.00
Follow up weeks	7	28	-	-	-	0.02	0.00	1.00
Risk of bias	38	144	-	-	-	0.00	0.06	0.99
Published	39	145	-	-	-	0.00	0.00	1.00

Note. * p < 0.05; $I^2_{(2;3)}$ = Within- and between-report heterogeneity, respectively. k = number of clusters (reports). n = number of estimates. $R^2_{(2)}$ = the proportion of within-report heterogeneity explained by the covariate. $R^2_{(3)}$ = the proportion of between-report heterogeneity explained by the covariate. p = Likelihood ratio p-value, significant values demonstrate that the addition of the moderator significantly improved model fit. Estimate = Fischer-z transformed correlation; r = Pearson correlation. Report type = whether prosociality was self- or other-reported. Behaviour reporter = whether antisociality was reported by parents, teachers, co-workers, or researchers. Lag type = whether correlations across time controlled for baseline relationships. Follow up weeks = Measurement lag measured in weeks.

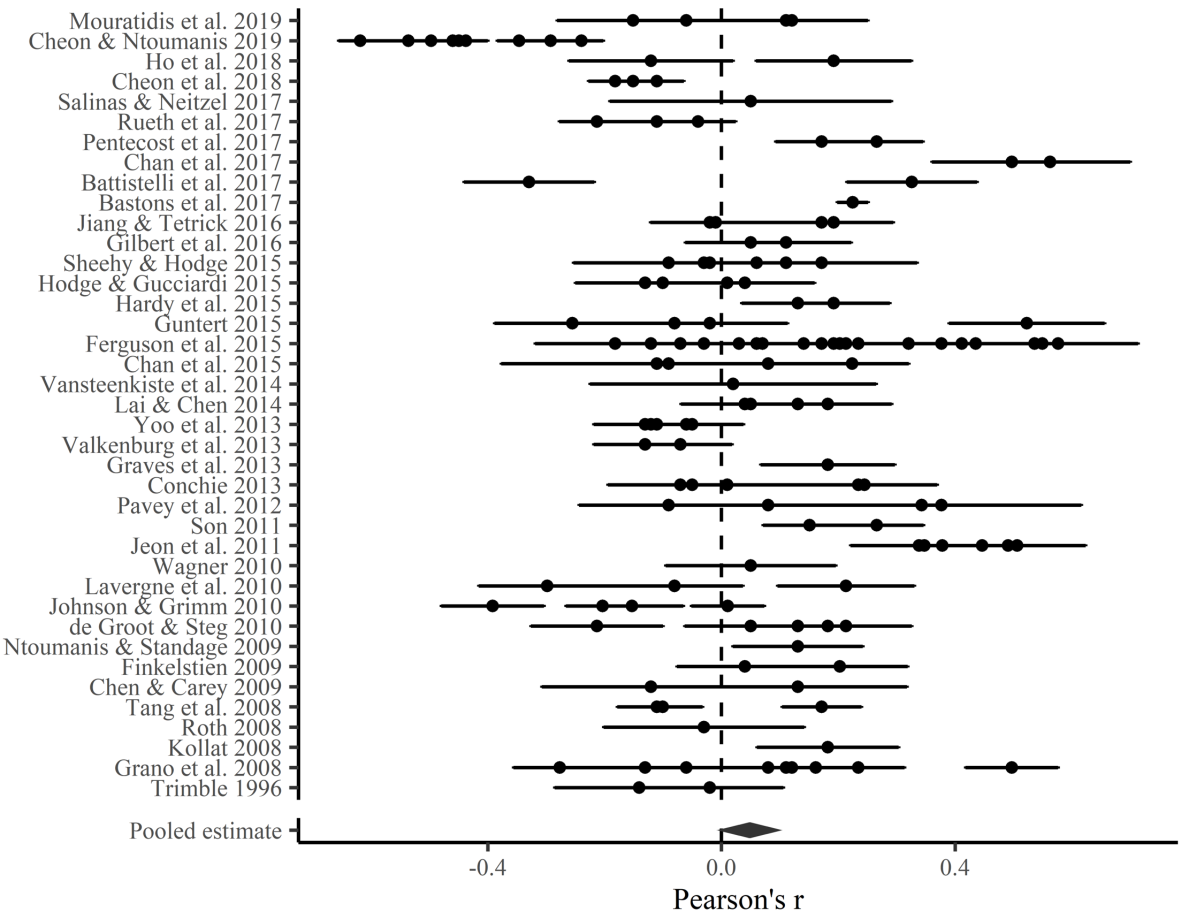

Figure 6. Forest plot of the association between control and prosocial outcomes.

Publication bias. We visually inspected funnel plots, tested whether publication status moderated the univariate meta-analytic effects, and conducted the 3PSM test for publication bias, for each of the above pairs of variables. The complete results of these tests are presented in *Supplementary Materials*. First, funnel plots did not indicate publication bias, with the exception of the link between autonomy and prosociality where there was some evidence of small-sample bias. Second, the moderation tests by publication status indicated that none of the observed effects varied as a function of publication status. Third, the 3PSM test indicated potential publication bias among studies of autonomy and prosociality ($\chi2(1)$ = 9.45, p = 0.002) and autonomy and antisociality ($\chi2(1)$ = 29.70, < 0.001). For the link between autonomy and prosociality, estimates adjusted for publication bias using the PET-PSSE method (Stanley, 2017) were similar to unadjusted estimates (unadjusted: r = 0.28 [95% CI 0.24, 0.31]; bias-adjusted: r = 0.26 [95% CI 0.16, 0.35]). The adjusted estimate indicates that the pooled effects obtained for these paths are similar to the estimates obtained from an unbiased sample of the population. However, the bias-corrected estimate for the link between autonomy and antisociality diverged from the original estimate (unadjusted: r = -0.09 [95% CI -0.15, -0.03]; bias-adjusted: r = -0.02 [95% CI -0.13, 0.08]), indicating that autonomy and antisociality are not related when all studies are included.

Autonomy and control. For completeness, we meta-analyzed the association between autonomy and control. Fifty-three reports (62 studies; 242 effects) included data that could be pooled. The pooled effect size was 0.07 [95% CI 0.00, 0.14]. These results, along with moderation and publication bias tests, are in *Supplementary Materials*.

Antisociality and prosociality. Finally, we meta-analyzed the association between prosocial and antisocial outcomes. Nine reports (10 studies; 33 effects) contained data that could be pooled. The pooled effect size was -0.12 [95% CI -0.29, 0.05]. A fuller presentation of these results is in *Supplementary Materials*.

Figure 7 presents an overview of the results of each univariate meta-analysis, one for each pair of variables examined in this review (specified along the X-axis). Moderating variables are on the Y-axis. Unshaded cells indicate that there was evidence of moderation, while shaded cells indicate there was no such evidence. As Figure 7 shows, for the correlations between autonomy and control, and prosociality and antisociality (i.e., columns 1-4 in Figure 5, which pertain to Hypotheses 1-4, respectively), there was only one substantive moderator of these associations (i.e., longitudinal effects moderated the association between control and antisociality). There was no evidence that substantive moderators including ‘Age’, ‘Gender’, ‘Geographic region’, ‘Reporter of pro/antisociality’, or ‘Report type’, accounted for variation in effects in columns 1-4. We discuss the practical significance of these results below.

Figure 7. Moderation analyses for pairwise correlations. *Note.* AUT = autonomy; CNT = control; ANT = antisocial; PRO = prosocial. Grey backgrounds indicate that the moderation

model did not significantly improve baseline model fit. Missing effects indicate a gap in evidence.

Two-stage structural equation modelling (TSSEM)

We next combined the above univariate meta-analyses into a single, multivariate model using the TSSEM approach.

First stage. Correlations were extracted from 134 reports. Correlation matrices were pooled using random effects meta-analysis. Table 5 presents the pooled correlations and heterogeneity indices.

Table 5

Correlations and heterogeneity indices for pooled correlation matrix

	1	2	3	4
1. Autonomy	-	95.83	92.21	94.38
2. Control	.06	-	90.97	92.13
3. Prosociality	.27***	.05*	-	96.26
4. Antisociality	-.09***	.15***	-.11	-

Note. Values under the diagonal are pooled correlations; values above the diagonal are I^2 statistics; stars indicate significant correlations; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Second stage. We used structural equation modelling on the pooled correlation matrix to estimate the effects of autonomy and control on prosociality and antisociality (Figure 8). As this was an unconstrained model, it fit the data perfectly. Autonomy was linked positively with prosociality (r = 0.27, 95% CI [0.23, 0.30]). Control was linked positively with antisociality (r = 0.16, 95% CI [0.11, 0.20]). Autonomy and control were not related (r =

0.06, 95% CI [0.00, 0.12]). As Figure 8 shows, pooled effects in the multivariate model were almost identical to those from each of the univariate models, providing support for Hypothesis 5—that autonomy and control have largely independent associations with prosociality and antisociality.

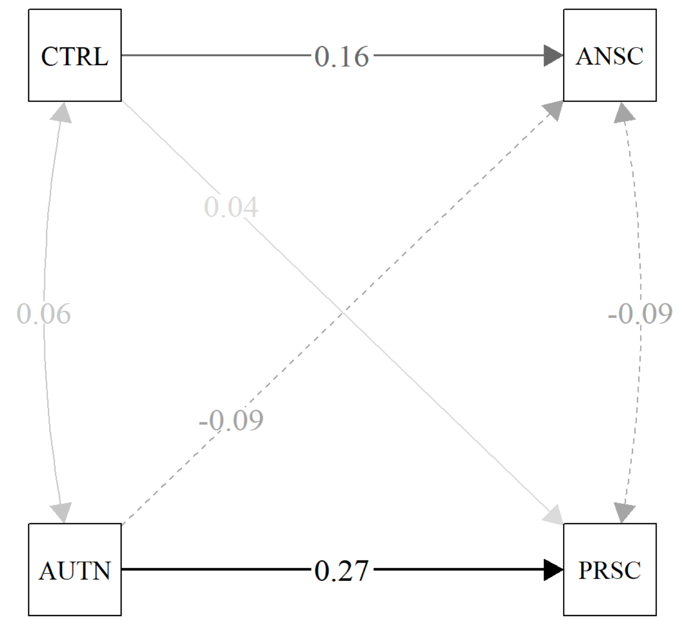

Figure 8. Simultaneous regressions for the unconstrained model. Darker paths indicate stronger links. Dotted paths indicate negative links.

To explicitly test our dual-process prediction that autonomy would be most strongly linked to prosociality, and control to antisociality (as proposed in Hypotheses 1-4), we constrained the diagonal paths from the model (see Figure 9) to be zero, and re-ran a TSSEM with these constraints. First stage results were identical to the unconstrained model (see Table 5). Second-stage results from this dual-process model are in Figure 9. The fit indices on the Stage 2 structural model were: χ^2 (df = 2, N = 67,342) = 17.87, p < .001; RMSEA = 0.01; CFI = 0.94; TLI = 0.81). Because the first TSSEM was fully saturated, the model fit for the second model can also be considered as a test of the difference between the two models. Given the poor fit of the dual-process model, our results suggest that cross-paths (e.g., from autonomy to antisocial outcomes) are indeed needed to adequately model the data.

The mixed evidence regarding the fit of the dual-process model (i.e., χ^2 being significant, and the relatively low TLI) indicates that the cross-paths are needed to achieve acceptable model fit. This can be considered support for a 'weak' dual-process model (i.e., the magnitudes of the cross-paths are small relative to the main paths, per Figure 6), and contrasts with a 'strong' dual-process model (Figure 7), wherein the cross-paths are redundant.

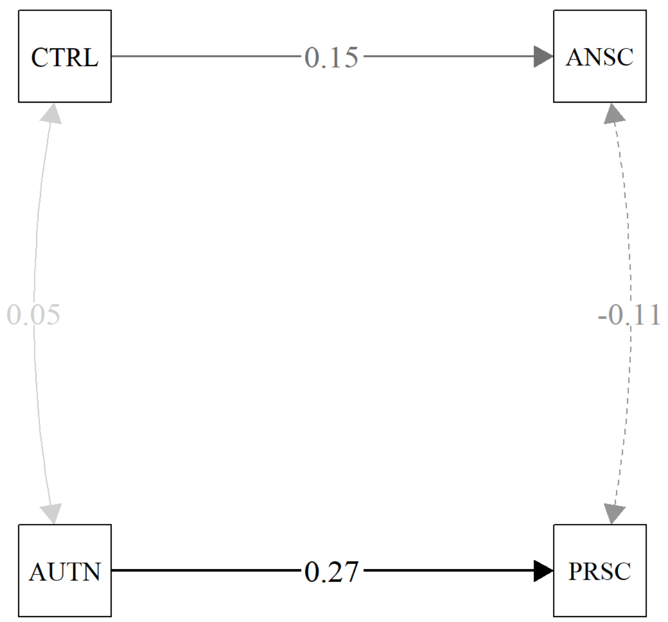

Figure 9. Simultaneous regressions for the dual-process model. Darker paths indicate stronger links. Dotted paths indicate negative links.

Intervention evidence

Seven reports (9 studies; 30 effects; *N* = 5,371; six published and one unpublished) examined relationships of interest using experimental manipulations. The majority of these trials manipulated autonomy to predict prosociality (6 reports; 7 studies; 14 effects). Only one report (1 study; 4 effects) manipulated control to predict prosociality. Three reports (4 studies; 9 effects) included effects where autonomy was manipulated to predict antisociality. One report (2 studies; 3 effects) manipulated control to predict antisociality.

We pooled all reports (14 effects) where an autonomy intervention was the predictor and the outcome was prosociality. All of these effects were obtained by comparing a treatment with a comparison group. As Table 6 shows, the pooled standardized mean difference was not significantly different from zero (*d* = 1.32, 95% CI [-0.11, 2.74]. There was substantial heterogeneity within reports ($I^2_{(2)}$ = 88.93%; $I^2_{(3)}$ = 10.97%). The covariates that significantly moderated the baseline model were 'Region', 'Age', 'Gender', and 'Study design'. While most of the effects were statistically non-significant, the effect of autonomy on prosociality was positive among European and male samples, and among non-randomized study designs. However, we note the small number of effects in the European, male, and non-randomized study design categories. We also note that while risk of bias did not moderate the effects among these studies, effect sizes for studies with a moderate risk of bias were large and positive (*d* = 2.18 [0.69, 3.66]), while this was not the case for studies with a high risk of bias (*d* = -0.10 [-2.27, 2.06]).

Table 6

Effects of experimental manipulations of autonomy support on prosocial outcomes

Moderator	k	n	d (95% CI)	SE	$R^2_{(2)}$	$R^2_{(3)}$	p
Baseline ($I^2_{(2;3)}$: 0.89; 0.11)	6	14	1.32 [-0.11, 2.74]	0.73	-	-	-

Region	5	11	-	-	0.16	0.00	.013*
Asia	2	5	1.01 [-1.07, 3.08]	1.06	-	-	-
North America	1	1	0.34 [-4.32, 5.00]	2.38	-	-	-
Western Europe	2	5	3.00 [1.13, 4.87]	0.96	-	-	-
Age	4	9	-	-	0.02	0.37	.003*
15-24 years	2	7	1.97 [-0.40, 4.35]	1.21	-	-	-
35-49 years	2	2	0.28 [-3.74, 4.30]	2.05	-	-	-
Gender	6	14	-	-	0.29	1.00	.045*
Mostly male	1	4	3.70 [1.74, 5.65]	1.00	-	-	-
Mixed gender	3	6	0.88 [-0.67, 2.43]	0.79	-	-	-
Mostly female	2	4	-0.07 [-1.98, 1.84]	0.97	-	-	-
Report type	6	14	-	-	0.08	1.00	0.11
Risk of bias	6	14	-	-	0.08	1.00	0.27
Published	6	14	-	-	0.01	0.07	0.67
Measurement lag	6	14	-	-	0.02	0.53	0.96
RCT	4	10	-	-	0.04	0.00	.004*
Yes	2	3	1.18 [-1.79, 4.15]	1.52	-	-	-
No	2	7	2.37 [0.37, 4.37]	1.02	-	-	-

Note. * $p < 0.05$; $I^2_{(2;3)}$ = Within- and between-report heterogeneity, respectively; k = number of clusters (reports); n = number of estimates; d = Cohen's d; $R^2_{(2)}$ = the proportion of within-report heterogeneity explained by the covariate; $R^2_{(3)}$ = the proportion of between-report heterogeneity explained by the covariate; p = Likelihood ratio p-value, significant values demonstrate that the addition of the moderator significantly improved model fit. Report type = whether prosociality was self- or other-reported. Measurement lag measured in weeks.

Discussion

SDT proposes that human propensities toward prosocial and antisocial behaviors are shaped by the degree to which the social environment supports or thwarts individuals' autonomy (Ryan & Deci, 2017). Given the critical need to promote prosocial behaviors and social cohesion across a diverse range of policy priorities, understanding the psychological processes that support prosociality is critically important (Biglan, 2015; Ryan & Deci, 2017). SDT provides an empirically testable account of how experiences of autonomy enhance prosocial tendencies, and conversely, how psychological control undermines these tendencies. This meta-analysis tested these claims, finding general support for our predictions.

Based on the effect-size thresholds advocated by Gignac and Szodorai (2016) and Funder and Ozer (2019), we found a moderate-to-large, positive association between autonomy and prosociality, among the 74 reports that tested this link (Hypothesis 1). This result remained medium-to-large following adjustments for publication bias. The association was also robust across observer-report and self-report measures of prosociality. The type of autonomy experience was the only statistically significant moderator of the model. The moderation result indicated that, while all experiences of autonomy linked positively with prosociality—as expected, the effect size for autonomous motivation was larger than for autonomy support. This result makes sense, as some autonomy support interventions may differ in the degree to which they conduce to individuals feeling autonomous. When experiences of autonomy are reflected in self-reports of autonomous motivation, these experiences have the strongest links to prosociality. Further support for the predicted link between autonomy and prosociality was found from longitudinal studies, with a moderate, positive link between autonomy and prosociality, providing evidence for the directionality of this association. The magnitude of this result indicates that experiences of autonomy are likely to have both short-term *and* longer-term consequences for individuals' prosocial outcomes (Funder & Ozer, 2019). This medium-to-large effect size is consistent with findings from other meta-analyses of the associations between relevant personality variables and prosocial behavior (e.g., Thielmann et al., 2020).

Regarding Hypothesis 2, we found a small, negative association between autonomy and antisociality. However, we note that this link reduced to near-zero when adjusted for missing studies (r = -0.02 [95% CI -0.13, 0.10]). Findings such as this, wherein autonomy has a positive association with prosocial outcomes, but is weakly linked with antisociality, have been taken by previous research to be consistent with a dual-process model (e.g., Bartholomew et al., 2011; Gillet et al., 2012; Haerens et al., 2015; Jang et al., 2016; Li et al., 2018; Vansteenkiste & Ryan, 2013). Further longitudinal studies are needed to test this effect, however.

Consistent with Hypothesis 3, we found a moderately-sized, positive association between control and antisociality. An effect-size of this magnitude suggests that control is likely to be associated with antisocial outcomes over both the short-term and longer-term (Funder & Ozer, 2019), and is consistent with recent meta-analytic evidence on the association between personality and antisocial outcomes (Lee et al., 2020). The positive association between control and antisociality was robust across both observer-rated and self-reported measures of antisociality. We found evidence of moderation by longitudinal study design, with longitudinal effects small and not significantly different from zero. The relatively small number of longitudinal reports (5, including 18 effect sizes) indicates that further longitudinal research is needed to better understand whether control precedes the development of antisocial outcomes.

Regarding Hypothesis 4, we did not find evidence of a negative association between control and prosociality, suggesting a weak and mixed association across studies (r = 0.05; 95%CI [-0.01, 0.10]). This finding is consistent with our predictions, wherein control has little association with prosocial outcomes (but a larger and more consistent association with antisociality, as per the dual-process model).

In support of Hypothesis 5, we found that the evidence for each of the hypothesized paths was robust in a single, multivariate model (i.e., the TSSEM) that included all four paths of interest simultaneously. That is, when we ran a multivariate meta-analysis, the pooled effects between autonomy and control, and prosociality and antisociality, did not substantially change results from the univariate models. Consistent with predictions from SDT, the association between autonomy and prosociality appeared to be largely independent of any co-occurring associations between psychological control and prosociality, and vice-versa for the associations between control and antisociality. We discuss the practical implications of this below.

Further, we found no evidence that exogenous moderating variables accounted for variation in pooled effect sizes across the paths we tested, consistent with Hypothesis 6. Put differently, the associations between each of autonomy and control with prosociality and antisociality were consistent across geographic location, age, and gender categories, and did not vary according to whether the outcome measures were self-reported or other-reported (see Figure 7). Together, these results are consistent with the idea that experiences of autonomy universally lead to prosocial outcomes, and control to more antisocial outcomes (Ryan and Deci, 2107).

Finally, we identified a number of experimental studies that manipulated autonomy and control, examining subsequent effects on prosocial and antisocial outcomes. We obtained sufficient effect sizes (14 effect sizes from 6 reports) to meta-analyze and test moderation effects of autonomy interventions on prosocial outcomes, but this was not the case for the other pairs of variables. In examining the effect of autonomy interventions on prosociality, we did not find evidence of an overall positive effect (see Table 6). However, we did find that geographic location, gender, age, and study design were significant moderators of the meta-analytic effect. Further, among intervention studies, we found large, positive effects among studies with a moderate risk of bias rating (*d* = 2.18 [0.69, 3.66]), unlike those with a high risk of bias (*d* = -0.10 [-2.27, 2.06]). This provides some evidence that, among better-designed studies, autonomy support interventions are likely to have prosocial effects. However, given the small sample size, further well-designed studies of autonomy interventions are needed.

Evidence gaps

A central aim of this review was to highlight questions in need of further examination to progress the field. Figure 7 provides a visual overview of where evidence gaps exist among longitudinal and cross-sectional studies. First, more research is needed on the association between control and prosocial and antisocial outcomes, with the majority of research instead examining the correlates and consequences of experiences of autonomy. Second, more research is needed on the effects of autonomy and control on prosociality and antisociality in geographical regions outside of North America and Western Europe. Studies in Africa, South America, the Middle East and Eastern Europe are notably lacking. Third, although the effects in parenting and classroom contexts have been relatively well-researched, more evidence is needed for the effects in other domains such as sport, healthcare, and work settings. Given its potential societal import, research is especially needed in organizational settings to understand the effects of leader or manager behavior on subordinate prosocial and antisocial outcomes.

In terms of methodological issues, this meta-analysis identified a relatively small number of experimental studies, which restricted the causal inferences we could draw. Specifically, there were only sufficient effect sizes to meta-analyze the effect of autonomy on prosocial outcomes (14 effect sizes from six reports). We were unable to meaningfully meta-analyze experimental evidence for the other univariate paths. Future research is therefore needed to evaluate the consequences of both autonomy and control interventions on prosocial and antisocial outcomes. Likewise, although we found longitudinal evidence for the link between autonomy and prosociality, more longitudinal research is needed for the other paths (i.e., Hypotheses 2-4). A key advantage of longitudinal research is that it enables an analysis of the effects of experiences of autonomy and control dynamically and over time, which is often difficult to achieve in experimental research. It may, however, be ethically dubious to implement long-term experimental inductions of psychological control. Longitudinal designs with individual fixed effects panel data are a potential solution, as they enable within-person changes to be assessed, thereby more closely approximating an experimental design.

Another methodological concern is publication bias. To address this, we included unpublished data in our search, and then conducted several tests for potential publication bias. We found evidence of potential publication bias for two of the four univariate paths we examined (noting that tests of publication bias are more exploratory than confirmatory, and other biases such as outcome reporting bias and language bias may explain systematic differences in the dissemination of studies; Song et al., 2020). For one of these paths (i.e., autonomy and prosociality), the bias-adjusted estimate (r = 0.26 [95% CI 0.16, 0.35]) was similar to the original estimate (unadjusted: r = 0.28 [95% CI 0.24, 0.31]), suggesting that the original result was robust to adjustments for publication bias. For the second path (i.e., autonomy and antisociality), the bias-corrected estimate reduced from a small, negative effect (r = -0.09 [95% CI -0.15, -0.03]) to being non-different from zero (r = -0.02 [95% CI -0.13, 0.08]). This small cross-path is consistent with the dual-process predictions offered within SDT. Altogether, while adjustments for missing studies yielded results that aligned with our hypotheses, correcting for publication bias has limitations (see Stanley, 2017), and future studies in this domain need to be sure to report all results, including statistically non-significant ones.

Finally, three of the seven intervention studies in this review were classified as having a high risk of bias. A high risk of bias is a threat to validity, and future intervention studies manipulating autonomy and control need to address these risks—particularly in relation to employing a randomized controlled designs, and blinding participants, trainers, and data analysts to experimental conditions. Our review highlights the need for more research on the types of autonomy support interventions, and the specific intervention components, that have the largest effects on prosocial outcomes across various domains of social and organizational policy. Emerging methods offer transparent ways of reporting those intervention components (Teixeira et al., 2020).

Theoretical implications

Our findings provide support for the claim that experiences of autonomy potentiate humans' prosocial and altruistic inclinations. We found correlational, longitudinal, and some experimental evidence for this claim. We expect that in autonomy-supportive environments, individuals experience greater integration and congruence, which bolsters prosocial outcomes such as empathy, compassion, and altruism. Similarly, when individuals experience support for autonomy, there is less of a need to protect and defend the ego at the expense of others. This means less aggression and interpersonal harm. Our findings are also consistent with the notion that controlling environments—which thwart basic psychological needs—lead to antisocial behaviors, perhaps as a way of preventing further erosion of their psychological needs. This latter path needs to be further examined via experimental manipulations of control.

Our findings also have implications for our understanding of human autonomy as a broad-based psychological nutriment. Autonomy appears to foster prosocial tendencies across a wide range of domains and groups of people. In the present study, we found support for our predictions across various cultural groups, age groups, and gender categories. From the point of view of SDT, autonomy plays a particularly central role in the prediction of well-being and healthy functioning (Ryan & Deci, 2017). However, there are of course two other basic psychological needs that may also be associated with prosociality and antisociality. Relatedness has a clear theoretical link to prosociality, given it centers on care for and from others. Competence may also link to prosociality if, for example, prosociality provides an opportunity to feel effective and have a positive impact (Weinstein & Ryan, 2010). An examination of the links between these other needs and prosocial and antisocial outcomes would shine further light on what is likely to be a variety of variables that facilitate prosocial functioning.

Finally, the present meta-analysis provided mixed support for a dual-process association between autonomy and prosociality on one hand, and control and antisociality on the other. In the combined TSSEM, we found ambiguous support for a dual-process model, wherein the cross-paths (i.e., autonomy to antisociality, and control to prosociality) were needed to ensure acceptable model fit. However, for the univariate analyses, when meta-analytic estimates were adjusted for potential publication bias, both cross-paths became non-different from zero, while the dual-process paths remained a similar magnitude (medium-to-large for autonomy and prosociality, and small-to-medium for control and antisociality). This pattern of findings is consistent with research on autonomy and control in other domains (e.g., Bartholomew et al., 2011; Haerens et al., 2015; Li et al., 2018; Jang et al., 2016). However, further longitudinal and experimental research is needed to corroborate these results.

Practical implications

Psychosocial interventions designed to promote autonomy-supportive approaches, for example in healthcare and education, have been widely studied. There is evidence that these interventions result in improved outcomes such as well-being and engagement (e.g., Gillison et al., 2019; Cheon, Reeve & Ntoumanis, 2018). The present study extends these findings to prosocial and antisocial outcomes. Our findings suggest, perhaps counter-intuitively, that prosocial objectives may be best achieved by resisting the temptation of controlling approaches. Instead, designing interventions that promote autonomy and autonomous engagement may be more likely to lead to desired behaviors. This is consistent with research highlighting the undermining effects of controlling messages in behavior-change (e.g., Legault, Green-Demers, Grant & Chung, 2007; van ‘t Riet & Ruiter, 2013). Examples of autonomy-supportive approaches to eliciting prosocial behavior may include explaining reasons for public health directives (e.g., in the context of COVID-19), organizational leaders offering choices to their employees, joint boundary-setting the school classroom, and parents providing reasons for decisions that impact their children.

As a further nuance, findings from correlational and longitudinal studies indicate that autonomy leads to prosociality, largely independent of the effects of low psychological control, and vice-versa for the links between psychological control and antisociality (i.e., Hypothesis 5). These findings suggest that interventions targeting increases in prosocial behavior (e.g., increasing individuals’ recycling practices, or engagement in community volunteering) may be most efficacious if they implement strategies that explicitly increase individuals’ perceived autonomy. In contrast, our findings indicate that interventions aimed at reducing antisocial behaviors (e.g., in schools or among prison populations) may be most efficacious if they directly address the issue of psychological control and how it may be reduced.

Strengths and limitations

This meta-analytic review has several strengths. First, it draws upon the theoretical foundations offered by SDT to make theory-derived predictions regarding the effects of autonomy and control on prosocial and antisocial outcomes. Second, we tested our predictions using state-of-the-art meta-analytic methods, including TSSEM, which provided a conservative test of our model—it enabled us to test a dual-process model of autonomy and control linked, respectively, with prosocial and antisocial outcomes. Third, we offer a multi-method test of the link between autonomy and prosociality, including cross-sectional, longitudinal, and experimental evidence.

There are, however, a number of limitations of this review. First, in examining the effects of autonomy and control on prosocial and antisocial outcomes, we did not control for third variables that might also explain these associations (e.g., genetics, group status, or, in the case of context-specific measures of autonomy or control, measure the extent to which individuals experience autonomy and control in other parts of their life). As a result, the present meta-analysis does not address the issue of how autonomy compares with other potential factors in predicting individuals' prosocial and antisocial dispositions, nor do we rule out additional independent influences on these outcomes.

Second, although we did not find evidence that geographic location, gender, nor age moderated the pooled effects, we cannot rule out that unmeasured variables account for the variation in effect-sizes in this meta-analysis. For all of the paths tested in this review, there was substantial between-study unexplained heterogeneity in effects. Future studies could explore other sources of potential variation in effects.

Finally, while we discuss the general theoretical basis for our predictions, we omit the possible mediating role of other proximal influences. Future work could examine such mechanisms to gain more insight into *how*, for example, autonomy leads to more prosocial outcomes, or why controlling environments foster antisocial tendencies. For example, research shows that when autonomously regulated, individuals tend to be more open and receptive to what is occurring around them, and to act in ways that are more aligned with their values and beliefs (Ryan & Deci, 2017). Might experiences of autonomy facilitate prosociality via social awareness and openness, or perhaps instead via values-alignment, or both? The relative contributions of various mechanisms and mediators needs to be further explicated.

Conclusions

Self-determination theory (Ryan & Deci, 2000; 2017) proposes that environments that support the experience of autonomy facilitate humans' innate inclinations to be prosocial, whereas controlling environments reduce individuals' prosocial tendencies, and often catalyze antisocial behaviors. This review meta-analytically tested these propositions, finding multi-method evidence that experiences of autonomy are associated with greater prosociality, and correlational evidence that control is linked with antisocial outcomes. These findings were invariant across cultures, genders, and, in almost all cases, age categories. Our findings have important policy implications for the diverse efforts within areas of social policy to increase voluntary prosocial behavior by individuals. For example, in reducing carbon consumption, protecting public health (e.g., during the COVID-19 pandemic), or increasing charitable giving, progress hinges on individuals and groups acting for the greater good, often at personal cost. Our results suggest that a critical ingredient in achieving progress on these challenges lies in adopting behaviors, processes, and policies that promote human autonomy.

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Note: References marked with an asterisk were included in the meta-analysis.

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