Perspective

Green teens: Understanding and promoting adolescents' sustainable engagement

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SUMMARY

Young people are disproportionally impacted by heatwaves, floods, droughts, and other impacts of climate change. They also have unique potential to catalyze the transformative sustainable change that the world needs now. How can this potential be leveraged? In this perspective, we present the sustainability motive-alignment hypothesis to understand and harness young peoples', especially adolescents', potential for sustainable engagement. The hypothesis posits that adolescents will be internally motivated to engage in sustainable behavior when they construe such behavior as a means of pursuing their personal motives for autonomy and status. The hypothesis also suggests that sustainability-promoting policies (educational programs, campaigns) can be improved by using techniques that reshape how adolescents construe sustainability—from a low-priority chore to an activity that embodies a personal priority. We discuss research priorities to expand and evaluate the sustainability motive-alignment hypothesis and to help better understand the psychological forces underlying adolescents' sustainable engagement.

INTRODUCTION

Today's young people are uniquely vulnerable to the climate crisis. They are the first generation to grow up in a world where they are faced with tangible impacts of global warming, such as heatwaves, floods, and droughts. A recent United Nations Children's Fund (UNICEF) report labeled the climate crisis a "child rights crisis": nearly half of the world's young people live in countries exposed to multiple, overlapping climate hazards that may threaten access to essential services (e.g., education, nutrition) in the upcoming decades.[1]

While young people are not responsible for climate change, many see themselves as part of the solution. Around the world, engaged youth are working actively to make a difference, such as via social media activities, civic engagement initiatives, or protests. In the words of "Fridays for Future" youth climate activists,[2] "Climate change is the greatest threat facing the world's children and young people. And so we too are rising."

Adolescents, in particular, have the potential to be at the forefront of global action on climate change.[1,3,4] As a group, adolescents are concerned about climate change, are motivated to make positive contributions to society, and are able to make and sustain lifestyle changes with apparent ease.[5–7] And yet, this does not mean that most adolescents consistently act on their concerns in their everyday lives. In fact, research has revealed an "adolescent dip" in sustainable engagement. For example, adolescents tend to show lower rates of sustainable, climate-relevant behavior (e.g., sustainable consumption, energy conservation) than younger children and adults do.[8–10] What explains this apparent paradox? What

can be done to help unleash adolescents' potential for sustainable engagement?

We argue that adolescents often fail to construe sustainable engagement as relevant to what they care deeply about in their day-to-day lives—in particular, their enhanced desires to feel autonomous and gain status among their peers.[11,12] As such, they often lack a sense of urgency to act on their climate concerns. Such lack of urgency may not be unique to adolescents. Yet, adolescents' sensitivity to immediate rewards, and the potency of the autonomy and status motives that drive their in-the-moment needs and wants, make adolescents especially susceptible to sustainability inaction.[11,13,14] This proposition does not imply a status quo, however. Instead, it offers unique opportunity to foster adolescents' internal motivation for sustainable engagement.

In this perspective, we present the sustainability motive-alignment hypothesis to understand and discover new ways to promote adolescents' sustainable engagement. The hypothesis is not designed to compete with or replace existing psychological accounts of sustainability—rather, it complements them with a developmentally informed approach from the vantage point of adolescent psychology. In particular, the hypothesis builds on recent advances in the understanding of adolescent behavior change, pioneered by Christopher Bryan[15,16] and elaborated on by others,[12,17,18] and applies these insights to the sustainability domain. The hypothesis also draws from developmental accounts of the motivational forces that sustain behavior change over time, especially during sensitive periods for learning and growth.[6,19–21] We outline research priorities to evaluate, refine, and expand the sustainability motive-alignment
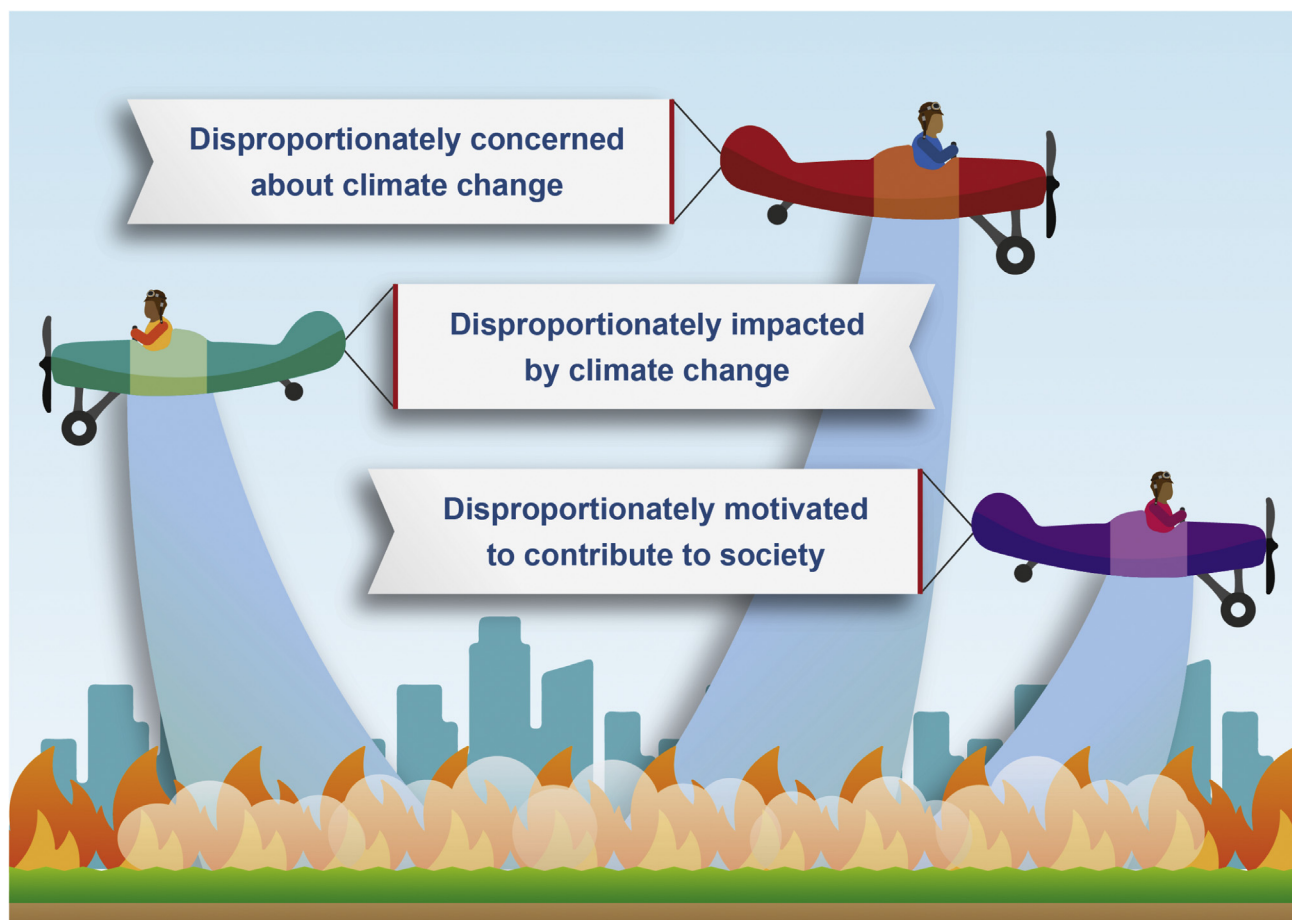
Figure 1. Reasons why adolescents are uniquely positioned to catalyze transformative sustainable change

hypothesis and to inspire the design of developmentally tailored policies to promote the sustainable engagement of young people.

ADOLESCENTS AS AGENTS OF SUSTAINABLE CHANGE

Adolescence is a time of biological and social transition, marked by rapid learning and personal growth. Adolescence starts with the onset of puberty (typically between 9 and 12 years of age) and ends when youth adopt mature social or societal roles (typically by their early twenties[6,11,13]). Although the transformational change that characterizes adolescence sometimes leads to mal-adjustment, it also creates strong potential for positive development and social and societal contribution.[7,22,23] Whether it is via acts of altruism (e.g., sharing with strangers[24]), civic engagement (e.g., volunteering[25]), support for social movements (e.g., Black Lives Matter[26,27]), or ethical consumption (e.g., adopting a plant-based diet[28]), many adolescents are motivated to make a difference to the world around them.

For at least three reasons, we propose that adolescents are uniquely positioned to propagate and amplify the societal change needed for climate change mitigation (Figure 1). First, most adolescents are concerned about the health of the planet. A public opinion survey, conducted among more than half a million adolescents from 50 countries worldwide, found that around two out of three adolescents consider climate change a "global emergency."[29] In another study involving adolescent participants from around the world, three out of four said they think "the future is frightening."[30] Indeed, there is consensus that most adolescents worry, sometimes excessively, over global warming and associated extreme weather events or biodiversity loss.[5,30–32]

Second, the climate crisis is consequential for today's young people. They must find their way in a world exposed to climate impacts, which are expected to become worse over the next decades.[1,33] For example, children born in 2010 are expected to experience at least a 4-fold increase in heatwaves across their lifetimes compared with those born in 1960.[34] This provides an important opportunity for policy: by raising awareness of generational vulnerability, climate change can be made "personal" and less psychologically distant for adolescents.[35,36]

Third, adolescents are often motivated to contribute to society and redress its fault lines.[7,23,37] One way to do so is to take a stand against generational injustice (e.g., "my generation unfairly bears the burden of the mess that older generations have left behind") and climate injustice (e.g., "wealthy countries caused climate change, and developing countries unfairly suffer the consequences"). Stereotypes hold that adolescents are narrowly

self-interested. Yet, adolescents' advancing social and cognitive skills and expanding social world motivate them to behave pro-socially and contribute positively to society.[22,23,38] While inclinations to be of help to others are evident throughout the lifespan, adolescence is an especially important time for contribution given that relevant skills and attributes (e.g., sensitivity to principles of justice, ability to consider the perspectives of others, desire to find purpose) blossom during this age period.[7,23] The school climate strikes in 2019, which attracted millions of protesters globally, provide a case in point that young people are able to make their voices heard for a collective cause.[4,39,40]

BARRIERS TO ADOLESCENTS' SUSTAINABLE ENGAGEMENT

One would expect, then, that adolescents will typically be committed to sustainability in their day-to-day lives. And yet, this is not the case. In fact, adolescents (especially in the ages of around 14 to 18) are less likely to hold environmental values and attitudes,[9,41] to experience connectedness with nature,[42] and to be conscious of environmental sustainability[43] compared with children and adults. This age-specific dip in sustainability is also reflected in the behavior that adolescents engage in. Adolescents show lower rates of sustainable behavior than children and adults do—an effect that has been found for measures that tap into diverse sustainable behaviors, including sustainable consumption, waste avoidance and recycling, and energy saving.[8–10,44,45] Thus, while most adolescents are concerned about the future of the planet, their sustainable engagement often lags behind.

Research has identified some of the psychological barriers to adolescents' sustainable behavior. One line of work has emphasized cognitive and normative processes, such as those outlined in the theory of planned behavior,[46] the value-belief-norm theory,[47] and related frameworks.[48] This work has documented the personal values, identity processes, beliefs, and norms that account for (and often constrain) adolescents' sustainable behavior. For example, it is quite common for adolescents to doubt their ability to engage in meaningful sustainable behavior (e.g., because they lack financial means or because their parents make impactful decisions for them), and this lack of environmental self-efficacy or perceived control can breed inaction.[49–51] Studies have also identified normative processes, finding that adolescents are less likely to behave sustainably when close others (e.g., parents or peers) fail to model or approve of such behavior (i.e., descriptive and injunctive norms, respectively[8,52–54]). Furthermore, although evidence is still limited, initial findings suggest that adolescents' sustainable behavior (or the relative lack thereof) is rooted in their budding value systems. Specifically, when adolescents have weaker environmental values (i.e., when they care less about nature and the environment), they are less likely to adopt an environmental self-identity and to feel able or obliged to help preserve the environment. These factors, in turn, impede their sustainable behavior.[51,55]

Another line of work has documented the emotional processes that influence adolescents' sustainable behavior. Much of this research has focused on anxiety, which can be considered an adaptive response to the real threat of climate change.[31] While some level of anxiety can activate youth to behave sustainably, very high levels of anxiety—especially when coupled with the idea that climate change is beyond one's control—can lead to despair, helplessness, and inaction.[56] Research has also explored positive emotions that underlie adolescents' sustainability. For example, this work has shown that adolescents' sustainable behavior is curtailed when they experience unwarranted, denial-based hope about environmental problems (e.g., "climate change is not as problematic as some experts think")—conversely, when adolescents' hope is based on trust in their own or others' ability to affect change, this can encourage sustainable behavior.[56,57]

Together, this work is valuable because it demonstrates that several psychological barriers to sustainability known to operate among adults are already active in adolescence. What is still missing, however, is a developmentally informed understanding from the vantage point of adolescent psychology—an account that emphasizes the psychological processes underlying sustainable behavior that are especially salient and impactful in adolescents. What is it like for an adolescent to be told to take shorter showers if they crave freedom to make their own decisions? How is it for an adolescent to try to uphold a meatless diet when they know that their friends make other dietary choices? Might some forms of sustainable engagement, such as taking part in climate protests, be more attractive to adolescents than other (e.g., private sphere) sustainable behaviors? How does an adolescent's climate concern weigh up against pressing developmental needs, such as establishing independence and being respected by peers? The sustainability motive-alignment hypothesis uses recent insights from adolescent psychology to offer a developmental account for adolescents' sustainable engagement.

SUSTAINABILITY MOTIVE-ALIGNMENT HYPOTHESIS

The sustainability motive-alignment hypothesis draws on recent developments in the field of adolescent behavior change and especially the work of Bryan et al.[15,16] and Yeager et al.,[12] who have pioneered approaches to promote positive behavior change by aligning the targeted behavior with adolescents' here-and-now priorities. Accordingly, the sustainability motive-alignment hypothesis posits that adolescents will be internally motivated to engage in sustainable behavior when they construe such behavior as a way to pursue their personal motives: the needs, goals, and desires that they deeply care about in their daily lives. By analogy, consider a teenager who is highly motivated to engage in physical exercise even if they experience the act of exercising itself as tedious or painful. Because physical exercise provides them benefits they care about—e.g., feeling fit, achieving a desired physique—they are motivated to invest in it. Similarly, the sustainability motive-alignment hypothesis predicts that adolescents will be committed to engaging in sustainable behavior when they view such behavior as being aligned with their heartfelt priorities. As such, the hypothesis builds on the psychological principle that individual behavior is energized by and organized around the fulfilment of personal motives.[19,58,59]

Adolescents are sensitive to experiencing immediate rewards.[13,14] It is often difficult for them to make behavioral choices in the interest of long-term outcomes if it is not clear

how such choices benefit them in the moment.[12,60] This sensitivity to short-term rewards is consequential. It explains, for example, why adolescents are prone to engage in impulsive, risky behaviors (e.g., substance use, sexual risk-taking). Even if they are aware of long-term consequences and risks, they do not always take that knowledge into account in determining their actions. Similarly, adolescents engage in less sustainable behavior than one would expect given their awareness of climate change because it is not sufficiently rewarding with respect to what they need or want in the here and now.

The sustainability motive-alignment hypothesis posits, however, that it may be possible to redirect the motivational power of adolescents' short-term orientation: when adolescents construe sustainability as aligning with their core motives, it will become more instantly appealing for them to endorse environmental values, to adopt an environmental self-identity, and to engage in sustainable behavior. Importantly, initial shifts in how adolescents construe sustainability—from a commitment they ought to make to a commitment they want to make—may be self-sustaining.[19,20] The rewarding feelings of autonomy and status that stem from engaging in sustainable behavior may serve as a gateway to a more enduring sustainable lifestyle. For example, over time, the recurrent engagement in sustainable behavior may lead adolescents to consider sustainability as an increasingly important or characteristic part of who they are and to seek environments and further activities (e.g., involvement with extracurricular activities) that solidify their "green" identity.[61–63] Consider the example of adolescents adopting a meatless diet; although it can be challenging at first to stop eating meat, for many adolescents, it becomes easier over time once they have incorporated their new diet as part of their identity and daily routine.[28]

The sustainability motive-alignment hypothesis rests on the premise that adolescence is a time of strongly enhanced motives to pursue autonomy and peer status. These motives shape how adolescents make sense of and act on the world around them. Adolescents are tempted to engage in behaviors that allow them to express independence or garner status among peers. Conversely, they will often refrain from behaviors that are irrelevant to or even threaten these goals.[12,16] Of course, autonomy and status motives are not unique to adolescence.[64,65] However, biological changes and an expanding social world make these motives especially potent during adolescence.[12,66,67] As such, autonomy and status motives may constitute key psychological levers to unleash adolescents' potential for sustainable engagement.

Adolescents' autonomy motive

Adolescents care deeply about experiencing agency over their lives. They want to have a say about things that matter to them, act with a sense of volition, and be treated in ways that acknowledge their perspective.[11,12,68] One manifestation of the autonomy motive is adolescents' tendency to distance themselves from, and sometimes rebel against, authority figures.[16,69] Adolescents increasingly disagree with adults' viewpoints and readily perceive adults' behavior toward them (e.g., prohibitions, unsolicited advice) as a threat to their autonomy (e.g., "don't tell me what to do, I can think for myself"). Due to their growing concern for social justice,[7,38] they often express reactance

against authorities who they perceive to be self-interested (e.g., "greedy multinationals"), irresponsible (e.g., "treacherous politicians"), or narrow minded (e.g., "ignorant parents").[16,69,70]

Adolescents' peer status motive

Similarly, adolescents also have a strong need to be esteemed or respected by peers, who play an increasingly central role in their lives.[71,72] They pursue the positive feelings that accompany behaviors that peers value (e.g., feeling respected) and avoid the negative feelings that result from peer disapproval (e.g., feeling scorned).[13,73,74] Adolescents are therefore susceptible to peer influence. They look to their peers to infer social norms, and they are tempted to conform to these norms because doing so helps them to be part of the ingroup.[75] Adolescents' susceptibility to peer influence can contribute to problematic behavior. For example, the mere presence of peers increases adolescents' risky, unhealthy, and rule-breaking behaviors.[76–78] Yet, by the same token, adolescents can also positively influence each other, such as by spreading responsible and prosocial norms or contributing to a positive social climate in their schools.[79,80]

Aligning sustainability with autonomy and peer status

The sustainability motive-alignment hypothesis posits that—despite their widespread concern about climate change—adolescents often construe sustainability as irrelevant, or even detrimental, to their pursuit of autonomy and status. They do not typically see how committing to sustainable goals (e.g., by consuming green products or engaging in climate protection initiatives) will help them experience the autonomy or status they desire. Accordingly, they will often fail to commit to sustainability because it has little personal priority. For many adolescents, sustainable behavior thus resembles a chore: behavior that is "right" or "needed" but not motivating in and of itself.[81] Even worse, some adolescents may think that engaging in sustainable behavior compromises their autonomy and status. For example, they may view such behavior as a form of compliance with adults' directives (e.g., sustainable behavior "is for babies who obey what nagging environmentalists tell them to do") or as behavior that is counter-normative or characteristic of outgroups (e.g., sustainable behavior "is not for me, but for rich kids who need something to whine about").[53,82,83]

Conversely, the hypothesis also posits that adolescents who do construe sustainability as aligning with their core motives will often be motivated to act accordingly. It will be attractive to them to adopt green values and identities and to behave sustainably because it has personally relevant, immediate payoff: it offers an avenue to being respected or attaining status among peers (Figure 2). For example, these adolescents may think that sustainable behavior "is for socially conscious people who are mature enough to think for themselves and stand up for what is right."

While the sustainability motive-alignment hypothesis has yet to be tested, there is indirect evidence for its core tenets. For example, adolescents who perceive sustainable behavior as a means to express their identity, or as normative among peers (i.e., as autonomy assertive or status relevant), show increased rates of such behavior.[55,84] Furthermore, young climate activists are often drawn by the sense of independence or status that comes with joining a social movement. For example, teens
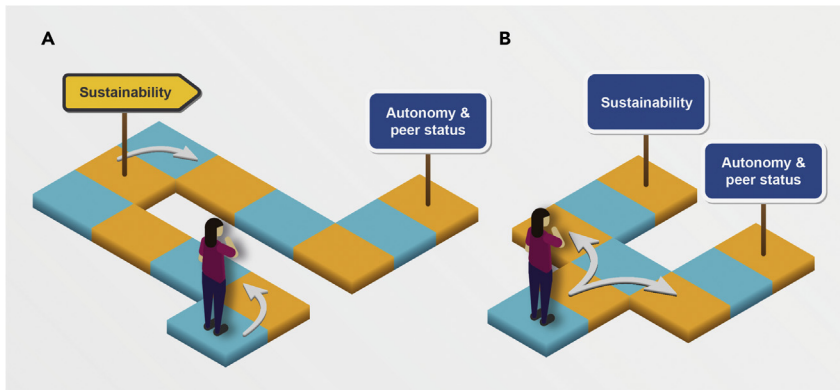
participating in the Fridays for Future protests reported that they wanted to confront societal unfairness and voice the concerns of their generation.[40,85,86] Conversely, there is also evidence that adolescents who are less committed to sustainable goals often feel that these goals are enforced by authorities or disapproved of by the social groups that they are part of, thus thwarting their core motives.[87,88]

POLICY IMPLICATIONS

The sustainability motive-alignment hypothesis suggests that the effectiveness of sustainability-promoting policies (e.g., educational programs, campaigns) can be improved by using techniques that reshape how adolescents construe sustainability—from a low-priority chore to an activity that embodies what they deeply care about (Figure 3).

Promoting adolescent behavior change is no small feat, especially when the relevant behavior change incurs distant, rather than immediate, benefits.[12,60] Still, many policies that promote sustainability emphasize the long-term consequences of ecological problems and encourage adolescents to consider the long-term consequences of their actions. Such an approach is understandable; long time horizons are inherent to ecological problems. Yet, these policies fail to address the very reason why many adolescents find it hard act on their climate concerns—they do not help adolescents to see how behaving sustainably can be personally relevant and immediately rewarding.

Another challenge for such policies derives from adolescents' resistance to being told what to think or do, especially by authorities. When sustainability-promoting policies are delivered or endorsed by adults (e.g., educators who teach educational programs), this may limit their motivational power—especially when the policies use techniques or language that insufficiently respect adolescents' autonomy.[68] It is important for adolescents to feel that their perspectives are taken seriously. A common pitfall for policies is to explain to adolescents how they can behave sustainably rather than invite them to contribute their own ideas so that they know their views are valued.[12,83,89] Finally, sustainability-promoting policies often send the implicit message that, as a group, humans do too little to protect the environment. This happens, for example, when policies communicate that we can no longer afford to consume the Earth's resources in the way we currently do. While this message is

factually correct, it may lead adolescents to infer that engaging in sustainable behavior is against prevailing social and peer norms, which reduces its appeal.[53,90]

Of course, traditional policies can still exert positive effects. For example, well-designed and implemented educational programs (e.g., programs that are based on decision-making theories and teach relevant knowledge and behavioral skills[46,49]) are reasonably effective to raise environmental awareness and encourage behavior change—even in adolescents.[83,91] However, the sustainability motive-alignment hypothesis provides a new perspective for increasing the effectiveness of such policies: by reframing sustainable engagement as an autonomous choice that is respected by peers, it may be possible to make sustainable behavior change more rewarding in the here and now.

Several developmentally tailored strategies can be used to align sustainability with adolescents' autonomy and status motives. For example, media campaigns or educational programs could prompt adolescents to construe sustainability as an opportunity to stand up against the unjust behavior of authorities (e.g., older generations leaving a burden for young people; fast-fashion brands appealing to young consumers but doing little to limit their climate impact). Similarly, they could convey that young people can do better than older generations that have allowed the climate crisis to get this far. Alternatively, such strategies could frame sustainability as a means of contributing to society in a way that is respected by peers. For example, they could depict young environmentalists as respected leaders of their generation.[75]

While still an emerging field of research, similar techniques have been used successfully in other domains of adolescent behavior change. For example, in experiments that addressed adolescents' junk food snacking, researchers framed healthy eating as a way to take a stand against unfair practices of the food industry, which engineers junk food and uses smart marketing techniques to make their products addictive to youth.[16,92] This approach helped adolescents to make healthier food and drink choices. In another experiment, limiting social media use was presented to adolescents as a way of joining a counter social movement and asserting independence from social media companies, which use addictive platform designs to keep their users online for the sake of maximizing advertisement revenue.[17] This approach increased adolescents' motivation to cut back on their social media use. Other research tested the effects of social network interventions, in which influential, high-status peers are selected to diffuse norms regarding a target behavior such that the behavior gains more status appeal and behavior change becomes more attractive. These interventions effectively
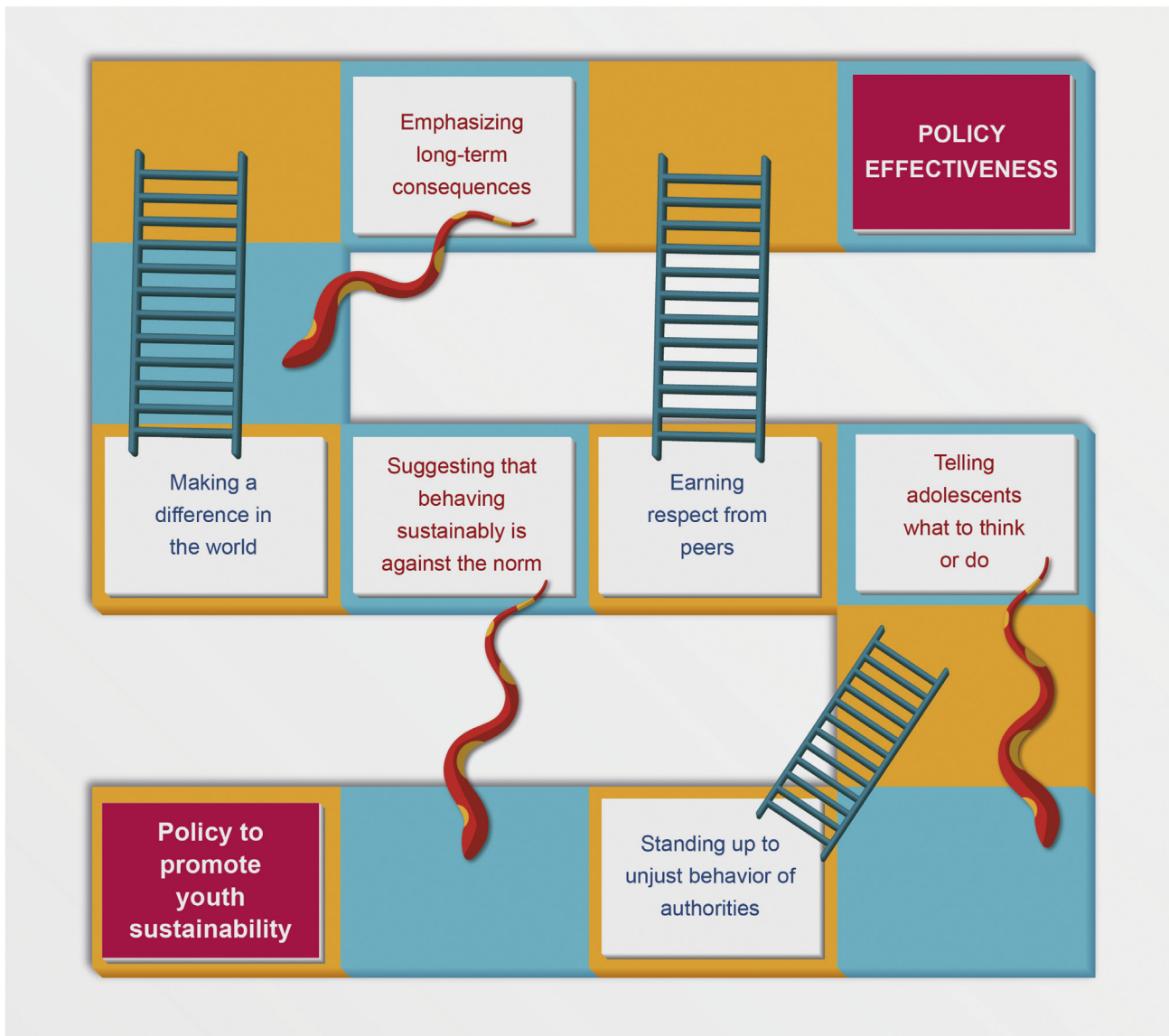
Figure 3. Opportunities and pitfalls for optimizing the effectiveness of sustainability promoting policies for adolescents

prevented adolescents from starting smoking,[93] increased adolescents' physical activity,[94] and helped adolescents forgo sugary drinks in favor of water.[95]

One other example comes from research into a youth prevention program to reduce health disparities, called "The Bigger Picture" (https://thebiggerpicture.youthspeaks.org[96]). The effectiveness of The Bigger Picture at promoting health behavior change has yet to be thoroughly evaluated. Nevertheless, its design is particularly powerful and may serve as inspiration for the development of similar motive-alignment approaches to promote behavior change in other domains. The Bigger Picture harnesses adolescents' strongly held values of defiance against authority and social justice to promote health behavior. It does so by enabling participants to create (rather than just consume) the campaign messaging and express themselves artistically. Adolescents attend workshops in which they learn about a health

problem (e.g., type 2 diabetes), its social and racial disparities, and its causes and perpetuating factors (e.g., poverty, advertising practices). They are invited to write a personal, spoken-word narrative around the drivers of the health problem, linking the information they learned to their own experiences. Some of the narratives are developed into videos and disseminated to young audiences. The narratives aim to raise awareness of the health problem, change social norms, and activate youth to take a stand against injustice and become engaged in initiatives to reduce health disparities. Many narratives are hard hitting and highlight, for example, how manipulative industry strategies, including the targeted marketing of unhealthy products to vulnerable groups, have impacted the lives of family members. Thus, The Bigger Picture harnesses adolescents' desire to be heard, to take control, and to contribute to social justice while enabling them to engage with creativity. The program simultaneously

supports the agency and health literacy of those who participate in the program and engages young audiences with its public health message by virtue of the authenticity of its youth-generated content.

Importantly, the techniques discussed here do not offer blueprints for policy. Rather, they provide proofs of concept that help develop theory and illustrate the potential of harnessing adolescents' prioritization of autonomy and status to promote behavior change. Notably, one public health campaign has already implemented similar techniques at scale. For more than 20 years, the US-based "Truth" anti-smoking campaign (https://www.thetruth.com[97,98]) has promoted an anti-tobacco social movement, reaching young people via targeted advertisements depicting rebellious adolescents exposing the "lies and manipulation" of the tobacco industry. In one early advertisement, adolescents piled hundreds of body bags outside a tobacco firm headquarters to visualize the daily death toll caused by the tobacco industry. Thus, much like the techniques discussed previously, Truth seeks to appeal to adolescents' rebellious inclinations, desire for agency, and sensitivity to social justice. National estimates indicate that the Truth campaign prevented around 450,000 young people from initiating smoking in the first 4 years since its launch.[97] These findings illustrate the potential of motive-alignment techniques for promoting adolescent behavior change, which may be implemented to promote sustainable behavior change as well.

RESEARCH PRIORITIES

Here, we outline research priorities to further develop the sustainability motive-alignment hypothesis and evaluate its promises and boundaries. We discuss theoretical and methodological challenges that need to be addressed and offer the rudiments of a research agenda to better understand the psychological forces underlying adolescents' sustainable engagement from a motive-alignment perspective.

Adolescence is marked by rapid psychological change.[6] Accordingly, the psychological determinants of adolescents' sustainable behavior are likely dynamic as well. Prospective longitudinal research is needed to add developmental precision to the sustainability motive-alignment hypothesis. A critical question is how the nature and motivational potency of autonomy and status motives change over the course of adolescence and into young adulthood. Research that addresses this question should help to identify sensitive developmental stages during which the implementation of motive-alignment policies may be especially promising. Relatedly, an important question is whether the basic principle underlying the sustainability motive-alignment hypothesis (i.e., people are internally motivated to engage in sustainable behavior when doing so fulfills prominent motives) extends beyond adolescence. Autonomy and status motives do not disappear after adolescence, but they do become less salient. In modern, industrialized societies, motives surrounding the exploration of future life pathways (e.g., romantically, professionally) and, somewhat later, kin care become increasingly prominent in the early and mid-twenties.[99–102] Research could explore the viability of targeting these motives in sustainability-promoting policies for young adults. For example, policies that prompt reflection on how sus-

tainability transitions will shift professional opportunities in various work sectors may resonate well with young adults who are in the process of exploring vocational pathways—similarly, policies that prompt reflection on how the climate crisis will impact future generations may resonate well with young adults who are committed to ensuring the well-being of their offspring.

As is true for most theories of behavior change, the explanatory power of the sustainability motive-alignment hypothesis is likely heterogeneous. When does motive alignment provide a powerful account for adolescent sustainability, and when does it not? Understanding such heterogeneity is necessary to develop well-rounded theory and to be able to provide nuanced advice to policymakers. For example, our hypothesis assumes that adolescents can be encouraged to act on their climate concerns. Yet, a minority of adolescents do not experience such concerns in the first place.[5,87,103] Future research could test whether the effectiveness of motive-alignment policies hinges on adolescents' pre-existing concerns about climate change. A related research priority is to explore contextual boundary conditions to the sustainability motive-alignment hypothesis. For example, the effectiveness of sustainable motive-alignment policies may depend on whether they are implemented in social contexts that reinforce the targeted behavior (e.g., schools or families where prevailing norms already encourage sustainability). The effectiveness of such policies may also differ cross-culturally. Efforts to frame sustainable behavior as an opportunity to rebel against authority might, for instance, be less opportune in cultures where traditional values emphasize loyalty to authority (e.g., Confucian values rooted in East Asian cultures). Thus, an important challenge will be to scrutinize the sustainability motive-alignment hypothesis in context—while acknowledging its social and cultural contingencies.

Another research priority will be to address how policy-induced change can be sustained. The messages conveyed by sustainability-promoting policies, which are typically time limited, will often fade out or become less salient over time. Unless adolescents internalize these messages and adopt new behavioral routines, they may regress to their previous habits. Research will need to establish the conditions for internalization to occur. Adolescence is a time of identity formation—as such, research could investigate whether policies are more likely to have sustained effects if they help adolescents embrace sustainability as a means to express "who they really are." Moreover, research could investigate whether sustained policy effects are driven by the extent to which adolescents are introduced to new social environments and experiences (e.g., peers who model sustainability, experiences that increase nature connectedness) that further encourage their sustainable engagement. Thus, policy and behavioral intervention researchers should establish the social and psychological processes or feedback loops that drive sustained motive-alignment impacts.

While the sustainability motive-alignment hypothesis is primarily based on psychological theory and research, it raises questions and opportunities relevant to a broader community of social, behavioral, and applied experts. In particular, the sustainability motive-alignment hypothesis creates opportunity for transdisciplinary approaches, in which teams of academics and societal partners (e.g., policymakers, educators, youths themselves) with complementary expertise and perspectives

collaborate.[104,105] For example, transdisciplinary teams could comprehensively examine the complex interplay of structural, social, and cultural factors that drive motive-alignment processes. Transdisciplinary teams could also examine adolescents' sustainable engagement in light of the current "perfect storm of crises" (i.e., co-occurring financial, energy, and pandemic-induced health crises) that deepens climate change impacts and increases global inequalities.[106,107] Indeed, adolescents' readiness to make sustainable lifestyle changes may well depend on the adversity they experience in other life domains (e.g., poverty). Transdisciplinary collaboration can be powerful at yielding rich scientific understanding with societal impact.

CONCLUDING REMARKS

The sustainability motive-alignment hypothesis provides a new perspective on the sustainable engagement of young people. It complements existing psychological accounts of sustainability with a developmentally informed approach from the vantage point of adolescent psychology. It suggests that policies can make use of adolescents' widely held motives for autonomy and status to encourage sustainability. As such, the sustainability motive-alignment hypothesis provides a generative framework for understanding and promoting adolescents' sustainable engagement.

Policies to promote adolescents' sustainability abound. Besides educational programs and media campaigns, experts have begun to explore other types of intervention approaches as well (e.g., nudges, serious games[108,109]). We argue that motive-alignment techniques should complement—not replace—existing approaches. It will continue to be valuable to raise adolescents' climate awareness and inform them on the impacts of their behavior. What motive-alignment techniques add is that they may help increase adolescents' internal motivation to act on their climate concerns, thus making better use of their potential for behavior change. We hope that this perspective will spark progress on our understanding of the sustainable engagement of adolescents—a segment of the population that is well positioned to catalyze the collective behavior change that the world needs now.

AUTHOR CONTRIBUTIONS

Conceptualization, S.T., S.G., J.v.d.W., J.S., and A.P.; writing – original draft, S.T.; writing – review & editing, S.G., J.v.d.W., J.S., and A.P.; funding acquisition, S.T.

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