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Avoiding Social Risk in Adolescence

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Abstract

Adolescence is a period of life often characterized by behaviors that, prima facie, are irrational, such as seemingly excessive risk taking and impulsivity. However, these behaviors can be interpreted as adaptive and rational if one considers that a key developmental goal of this period of life is to mature into an independent adult in the context of a social world that is unstable and changing. It is proposed that for adolescents, the social risk of being rejected by peers outweighs other potentially negative outcomes of decisions, such as threats to one's health or the prospect of getting caught. Furthermore, peer influence in adolescence can lead to prosocial as well as antisocial behaviors. Neurocognitive mechanisms of peer influence include the social reward of being accepted by one's peer group, arousal, and increased mentalizing, which is associated with development of the social brain network. The findings from cognitive neuroscience and developmental psychology studies fit with recent public health evidence that the opinions of peers are particularly important to adolescents in areas such as school antibullying and antismoking campaigns.

Keywords

adolescence, social cognition, decision making

Adolescence is defined as the period of life between the onset of puberty and adult independence and is a unique time of biological, psychological, and social development (Patton et al., 2016). Societal expectations of adolescence differ widely among cultures, and yet adolescent-typical behaviors can be observed across cultures. A recent study of 5,404 people between the ages of 10 and 30 years in 11 different countries showed that across cultures, sensation seeking, the desire to experience novel and rewarding stimuli and to take risks, increases throughout the teenage years, is at its highest in the late teens, and then decreases in the 20s. In contrast, self-regulation, the ability to plan and regulate decisions and actions, gradually improves throughout adolescence, eventually stabilizing in the mid-20s (Steinberg et al. 2017; see Fig. 1).

Adolescent-typical behaviors can also be observed across species. Mammals undergo a period between puberty and sexually mature adulthood during which they show increases in exploration, risk taking, social approach behaviors, and social influence (Adriani, Chiarotti, & Laviola, 1998; Logue, Chein, Gould, Holliday, & Steinberg, 2014).

Throughout history, human adolescents have been ridiculed for their apparently tiresome and hedonistic behavior. One of Shakespeare's characters, for example, remarks in *The Winter's Tale* (1623/1969) that "I would there were no age between ten and three-and-twenty, or that youth would sleep out the rest; for there is nothing in the between but getting wenches with child, wronging the ancientry, stealing, fighting" (Act III, Scene iii, Lines 58–62). Underlying the negative stereotype is the assumption that adolescent-typical behaviors, such as risk taking, impulsivity, and self-preoccupation, are maladaptive and irrational. However, these behaviors can be viewed as adaptive and rational in the context of a key developmental goal of this period of life, that is, to mature into an independent adult (see Romer, Reyna, & Satterthwaite, 2017). During adolescence, young people need to become independent adults by developing a more complete sense of self-identity, while at the same time building stronger affiliations with their peer group when their social world is unstable and changing and when their social networks

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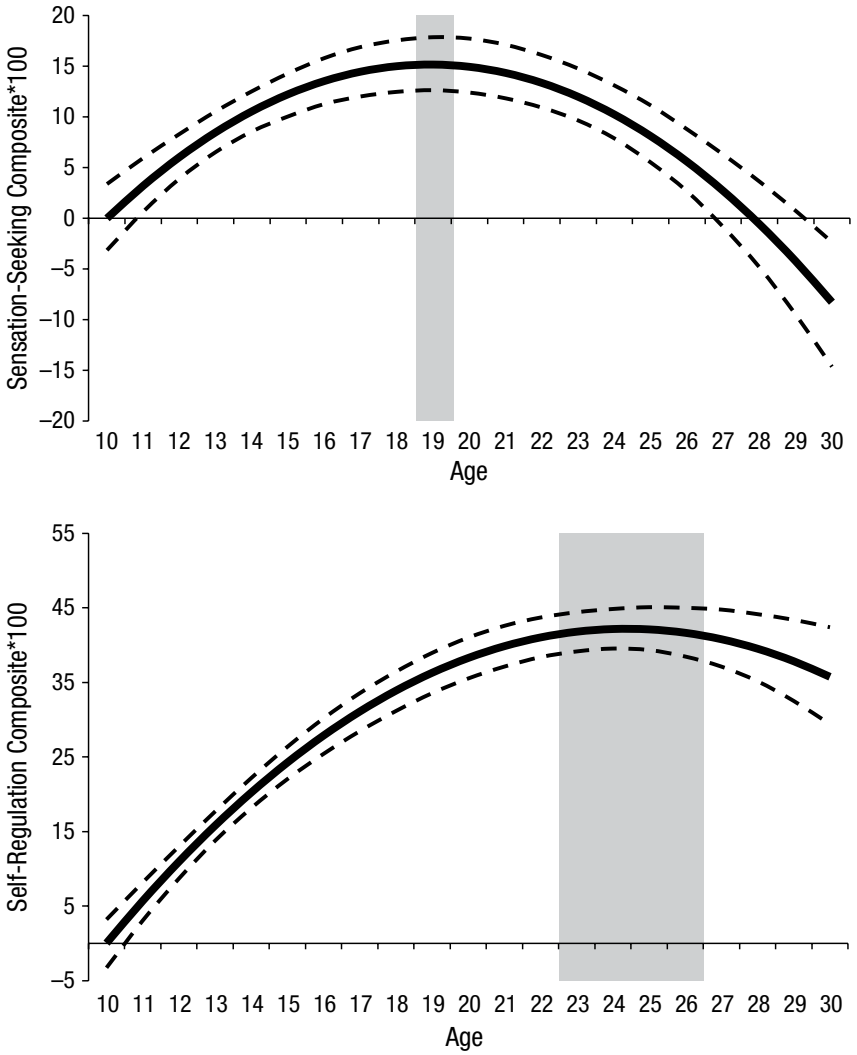

Fig. 1. Mean sensation seeking (top) and self-regulation (bottom) as a function of age, averaged across 11 different cultures. Gray shading denotes a plateau or peak, and dashed lines indicate 95% confidence bands. Figure reproduced from Steinberg et al. (2017).

start out chaotic and only gradually become refined and friendships become reciprocated (Burnett-Heyes et al. 2015). Instead of considering adolescence a period of heightened risk taking per se, a more complete understanding of adolescent-typical behaviors might benefit from a shift in focus to the social context in which risk taking often occurs.

Do Adolescents Take More Risks?

Adolescents, as a group, take more risks than children or adults, in domains such as experimentation with illegal substances, risky sexual behavior, criminal behavior, and driving (Patton et al., 2016). The leading cause of death in young people between the ages of 10 and 24 years, especially young men, is accidents, which are often caused by risk taking, such as reckless driving (Viner et al. 2011). On this basis, adolescence has been conceptualized as a period in which death is potentially preventable, unlike during other stages of life in which the cause of mortality is primarily health related (Dahl, 2004).

However, the picture is more complicated than depicted by the stereotype of the reckless and thrill-seeking adolescent. First, excessive risk taking resulting in death is fortunately rare, with survival rates of North American high school students being over 99.5%—most adolescents do not take extreme risks (Willoughby, Tavernier, Hamza, Adachi, & Good, 2014). Even for less extreme risks, there are large individual differences: Some individuals are risk takers, while others are not (Crone, van Duijvenvoorde, & Peper, 2016). Second, it

is important to consider wider contextual factors that enable risk taking in adolescence. A key contextual factor is the increased freedom permitted by parents and society. Adolescents are given more independence than children, spend more time unsupervised, and are allowed and encouraged to make their own decisions, and this is associated with increased exploration and risk taking (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003).

Peers Are a Significant Determinant of Adolescent-Typical Behavior

Another key contextual factor is the increased influence that peers have on adolescents. The amount of time spent with same-sex peers increases between childhood and adolescence, until mid adolescence (around age 14), when it appears to peak (Lam, McHale, & Crouter, 2014). What their peers think about them starts to have more influence on adolescents' (13–17 years) evaluation of their social and personal worth (O'Brien & Bierman, 1988). When adolescents are with peers, they are more likely to take risks, such as engaging in reckless behavior and experimenting with drugs, alcohol, and cigarettes, compared with when they are alone (Reniers et al. 2016). Lab experiments have shown that adolescents and young adults between the ages of 13 and 24 years are more likely to take driving risks when with friends, compared with when alone. In contrast, adults' (25 years and over) driving risks are unaffected by peers (Gardner & Steinberg, 2005). This is mirrored by findings from data from car accidents, which indicate that the risk of accidents for young drivers is heightened when they have a passenger in the car (Chen, Baker, Braver, & Li, 2000). Adolescents' substance use behavior is also influenced by peers. Studies in Hong Kong, for example, have shown that having friends who smoke or who drink alcohol is the biggest predictor of adolescent smoking and drinking (Yuen Loke & Mak, 2013). A longitudinal study involving adolescents (10–15 years old at the start of the study) in California showed that perceived peer cannabis use predicts the onset and extent of the adolescent's own cannabis use over the next 3 years; a similar relationship was found for alcohol use (D'Amico & McCarthy, 2006).

Many studies of peer influence in adolescence have included only one age group, so comparisons across age often cannot be made. A study that included a large age range demonstrated that young adolescents' views about risk are especially influenced by other teenagers' views (Knoll, Magis-Weinberg, Speekenbrink, & Blakemore, 2015). In this study, 563 participants between the ages of 8 and 59 years were asked to rate the riskiness of everyday situations and were then presented with risk ratings of the same situations from other people, either teenagers or adults (these provided ratings were in fact fictitious). Participants were then asked to rate the riskiness of the situations again. All age groups were influenced by other people's opinion, but while children and adults were more influenced by the opinions of adults, young adolescents (12–14 years old) changed their ratings more toward the ratings of teenagers than toward the ratings of adults (Fig. 2; this result was partially replicated in a new group of 590 participants by Knoll, Leung, Foulkes, & Blakemore, 2017).

Peer influence can also have positive effects: A friend who discourages a young person from engaging in a particular risky behavior can reduce the tendency of

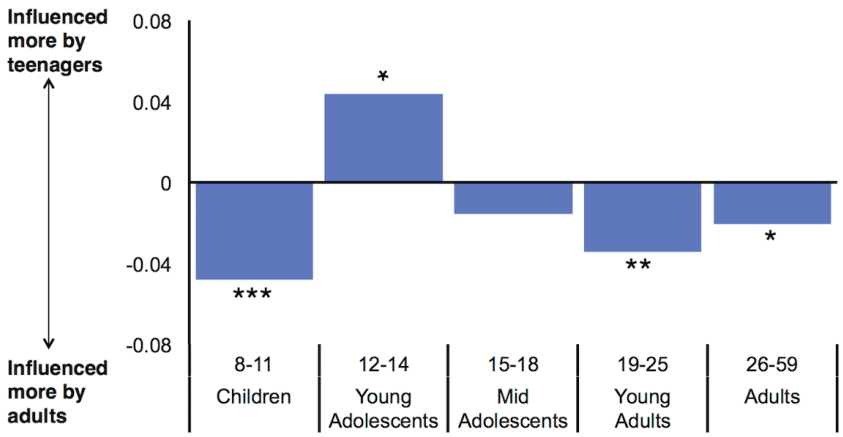

Fig. 2. Mean social influence on risk perception as a function of age group. Unlike other age groups, young adolescents are more influenced by the views of teenagers than by those of adults. Asterisks indicate significant differences from zero (*$p < .05$, **$p < .01$, ***$p < .001$). Figure reproduced from Knoll, Magis-Weinberg, Speekenbrink, and Blakemore (2015).

the young person engaging in that activity (Maxwell, 2002). Adolescents between the ages of 12 and 15 years are more likely to volunteer to help others in their community if they believe that other students in their school volunteer (Choukas-Bradley, Giletta, Cohen, & Prinstein, 2015). A study that employed a public goods game showed that 12- to 16-year-olds more generously allocated coins to their group after they saw peers approve such behavior (Van Hoorn, Van Dijk, Güroğlu, & Crone, 2016). Adolescents sometimes engage in risky decisions with the intention of helping other individuals, such as sticking up for a friend who is being bullied even though this risks becoming a victim of the bullies—this has been labeled "prosocial risk taking" by Telzer and colleagues (e.g., Do, Moreira, & Telzer, 2017). Thus, peer influence in adolescence can lead to prosocial as well as antisocial behaviors.

There are still many remaining questions about peer influence in adolescence. As is clear from the studies described above, the precise ages at which risk taking and peer influence peak are highly variable among studies, and this is partly because there are large individual differences. What underlies individual differences in peer influence? Another important question concerns why adolescents are particularly susceptible to peer influence, and that is what I turn to next.

Avoiding the Risk of Social Rejection

It has been proposed that adolescents are particularly susceptible to peer influence because they are hypersensitive to social exclusion (Blakemore & Mills, 2014). In a commonly employed social exclusion paradigm, Cyberball, in which participants play an online game of catch with two other (fictitious) players, adolescents' mood is lowered more than adults' after being excluded by the other players (Sebastian, Viding, Williams, & Blakemore, 2010). Individual differences in susceptibility to peer influence are pronounced, and one study showed that adolescents with low resistance to peer influence take more driving risks (in a driving video game) following social exclusion in Cyberball than adolescents with high resistance to peer influence (Peake, Dishion, Stormshak, Moore, & Pfeifer, 2013).

Overall though, adolescents appear to be hypersensitive to social exclusion, and this might lead to the risk of social rejection—or social risk—being particularly pronounced for adolescents. We have proposed that, in adolescence, social risk is weighted more strongly in decisions than are factors such as potential health or legal risks (Blakemore & Mills, 2014). In this context, going along with peers in order to avoid social risk, even if it means taking health and legal risks, might be seen as the rational choice because it reduces the possibility of social exclusion.

What is classified as a social risk is an open question, but the minimal prediction would be that any decision or action that might lead to peer exclusion would be considered a social risk. Social risk could be broader still and include anything that might lead to a reduction in one's position in the social hierarchy or even mild embarrassment or loss of face. It has been proposed that avoiding social risk is important for mental health in adolescence. Hypersensitivity to the threat of social risk, or chronic social rejection, might be associated with mental illnesses such as depression (Allen & Badcock, 2003), a condition that usually has its onset in early to mid adolescence (Joinson, Kounali, & Lewis, 2017). A study with more than 1,200 adolescents and young adults (14–24 years old) showed that self-reported friendship quality in adolescence predicts mental health resilience, defined as better-than-expected psychosocial functioning (lower psychiatric symptoms and higher mental well-being) 1 year later (van Harmelen et al., 2017). This study did not measure social risk taking, and it assessed self-reported friendship quality (dyadic relationships) rather than feelings of peer acceptance or peer influence, and therefore the links that can be made between this and social-risk avoidance are limited. However, the results suggest that there is adaptive advantage in high perceived friendship quality, and putative links with social-risk avoidance could be explored in future studies.

Neurocognitive Mechanisms of Peer Influence

There are multiple, nonmutually exclusive neurocognitive mechanisms that may lead to peers influencing adolescents' decisions and actions. One possibility is that increased sensitivity to social reward underlies peer influence. Functional MRI (fMRI) studies have demonstrated increased activity in the ventral striatum and orbitofrontal cortex, regions involved in reward processing, in adolescents relative to adults when they take simulated driving risks in the imagined presence of peers (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; note, though, that these regions are involved in many processes other than reward).

A second possibility is that the real or imagined presence of peers results in changes in arousal levels, and this in turn might affect behavior. In an fMRI study, on trials in which participants thought they were being observed while having their brain scanned, and even in anticipation of being observed, adolescents reported higher levels of embarrassment and showed higher skin conductance—a measure of arousal—than did children or adults (Somerville et al., 2013). In addition, thinking they were being watched and anticipating being watched were both associated with greater activity in the dorsomedial prefrontal cortex (dmPFC), a region

within the social brain, in adolescents compared with children. In the presence of peers, or when anticipating being evaluated by peers, increased fear of social evaluation might lead adolescents to think more about how peers judge their behavior. In this way, the presence of—or anticipation of evaluations by—peers might lead to increased mentalizing, the attribution of mental states and emotions to other people—a third possible mechanism underlying peer influence.

Mentalizing ability improves between late childhood and early adulthood (Dumontheil, Apperly, & Blakemore, 2010). In addition, the social brain network, including the dmPFC, anterior temporal cortex, posterior superior temporal sulcus, and temporoparietal junction, develops both in terms of gray matter and cortical thickness (Mills, Lalonde, Clasen, Giedd, & Blakemore, 2012) and activity in mentalizing tasks (Blakemore, 2008) during adolescence. This might equip adolescents with increasingly sophisticated abilities to understand other people's minds, at a stage when they are motivated to become affiliated with their peer group and to understand what their peers think of them. Further evidence for the involvement of the social brain comes from an fMRI study by Peake and colleagues (2013), which demonstrated that activity in the right temporoparietal junction during risky decisions on a driving game mediated the relationship between resistance to peer influence and risk taking after social exclusion in Cyberball.

Is Adolescence a Sensitive Period of Social Brain Development?

It is possible that adolescence represents a late sensitive period of brain development, during which the brain is particularly susceptible to certain environmental input, including social stimuli. The heightened effect of peer influence was demonstrated in a rodent study that showed that male adolescent mice (P28–P30) consume more alcohol when with other mice than when alone, whereas alcohol consumption in male adult mice (P84–P86) remained the same whether alone or with other mice (Logue et al., 2014). In male rats, social stress, such as social isolation, during adolescence has larger effects on adult social and sexual behavior (McCormick et al. 2013) and brain structure (Whitaker, Degoulet, & Morikawa, 2013), compared with the same social stress imposed earlier or later in development. Most rodent studies have been conducted in males, and results are less consistent for females (Burke, McCormick, Pellis, & Lukkes, 2017). Overall, however, the studies suggest that the presence of other rodents during adolescence is critical for healthy social and neural development.

As deprivation experiments would not be ethical to carry out in humans, another way to study sensitive periods is to assess age differences in the ability to acquire information. If a neural network is undergoing a period of heightened plasticity during a particular age range, individuals in that age range might be particularly adept at learning social or nonsocial information processed by that network (see Knoll et al., 2016). Future studies could investigate age differences in the acquisition of social information to test the hypothesis that the acquisition of complex social information about peers is at its highest in adolescence.

Implications for Public Health

Public health advertising aimed at young people's predilection for risky behaviors tends to focus on the health risks of these behaviors. However, the research reviewed in this article, as well as research in the public health domain (e.g. Dishion & Dodge, 2005), suggests that focusing on social norms and peer expectations might have more impact on adolescent behavior. This was supported by a public health study that looked at the influence of social norms on bullying behavior and conflict in schools (Paluck, Shepherd, & Aronow, 2016). Fifty-six U.S. middle schools (with children between the ages of 11 and 16 years) were included, with half the schools being assigned at random to an antibullying program. A number of students in each year participated in the program and were encouraged to lead grassroots antibullying campaigns in their schools and become the public face of opposition to bullying. Compared with control schools, in which no special antibullying programs had been introduced, schools that had received the student-led antibullying program reported that student conflict was reduced by 30%. Furthermore, when the antibullying campaign was led by more popular students, it had a greater positive effect on behavior.

A similar result was reported in a randomized controlled trial in which 12- to 13-year-old students in British schools who were rated by their classmates as influential were trained as "peer supporters" to try to encourage their peers not to smoke (Campbell et al., 2008). Over 10,000 12- to 13-year-olds took part in this study, and the results showed a significant reduction in smoking over a 2-year period following the peer support intervention, compared with the control group of schools in which no special program was put in place.

These studies reveal the power of peer influence in changing social norms of acceptable behavior. Adolescent susceptibility to peer influence and the motivation to avoid social risk can be beneficial and should be harnessed by public health campaigns aimed at young people.

Recommended Reading

Blakemore, S-J., & Mills, K. L. (2014). (See References). A review discussing social brain development and the propensity for peer influence in adolescence in more detail than in the current article.

Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social-affective engagement and goal flexibility. *Nature Review Neuroscience*, *13*, 636–650. A review article evaluating the evidence that social-affective processing is a critical component of adolescent neurocognitive and behavioral development.

Pattwell, S. S., Duhoux, S., Hartley, C. A., Johnson, D. C., Jing, D., Elliott, M. D., . . . Lee, F. S. (2012). Altered fear learning across development in both mouse and human. *Proceedings of the National Academy of Sciences, USA*, *109*, 16318–16323. A report of a study investigating the development of fear extinction learning in mice and humans, which demonstrated attenuated extinction learning during adolescence in both populations and altered synaptic plasticity in the mouse brain, and which underlined the importance of combining methodologies and species for a more complete understanding of the mechanisms of neurocognitive development.

Tamnes, C. K., Herting, M. M., Goddings, A. L., Meuwese, R., Blakemore, S.-J., Dahl, R. E., . . . Mills, K. L. (2017). Development of the cerebral cortex across adolescence: A multisample study of inter-related longitudinal changes in cortical volume, surface area, and thickness. *The Journal of Neuroscience*, *37*, 3402–3412. A report of a study that analyzed longitudinal structural imaging data from 391 individuals between the ages of 8 and 30 years from four developmental cohorts from three countries, showing remarkable consistency in developmental trajectories of the brain across samples.

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Declaration of Conflicting Interests

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References

Adriani, W., Chiarotti, F., & Laviola, G. (1998). Elevated novelty seeking and peculiar D-amphetamine sensitization in periadolescent mice compared to adult mice. *Behavioral Neuroscience*, *112*, 1152–1166.

Allen, N. B., & Badcock, P. B. (2003). The social risk hypothesis of depressed mood: Evolutionary, psychosocial, and neurobiological perspectives. *Psychological Bulletin*, *129*, 887–913.

Blakemore, S.-J. (2008). The social brain in adolescence. *Nature Reviews Neuroscience*, *9*, 267–277.

Blakemore, S.-J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Annual Review of Psychology*, *65*, 187–207.

Borawski, E. A., Ievers-Landis, C. E., Lovegreen, L. D., & Trapl, E. S. (2003). Parental monitoring, negotiated unsupervised time, and parental trust: The role of perceived parenting practices in adolescent health risk behaviors. *Journal of Adolescent Health*, *33*, 60–70.

Burke, A. R., McCormick, C. M., Pellis, S. M., & Lukkes, J. L. (2017). Impact of adolescent social experiences on behavior and neural circuits implicated in mental illnesses. *Neuroscience & Biobehavioral Reviews*, *76*, 280–300. doi:10.1016/j.neubiorev.2017.01.018

Burnett-Heyes, S., Jih, Y. R., Block, P., Hiu, C. F., Holmes, E. A., & Lau, J. Y. (2015). Relationship reciprocation modulates resource allocation in adolescent social networks: Developmental effects. *Child Development*, *86*, 1489–1506.

Campbell, R., Starkey, F., Holliday, J., Audrey, S., Bloor, M., Parry-Langdon, N., . . . Moore, L. (2008). An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): A cluster randomised trial. *The Lancet*, *371*, 1595–1602.

Chein, J., Albert, D., O'Brien, L., Uckert, K., & Steinberg, L. (2011). Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Developmental Science*, *14*(2), F1–F10.

Chen, L., Baker, S. P., Braver, E. R., & Li, G. (2000). Carrying passengers as a risk factor for crashes fatal to 16- and 17-year-old drivers. *Journal of the American Medical Association*, *283*, 1578–1582.

Choukas-Bradley, S., Giletta, M., Cohen, G. L., & Prinstein, M. J. (2015). Peer influence, peer status, and prosocial behavior: An experimental investigation of peer socialization of adolescents' intentions to volunteer. *Journal of Youth and Adolescence*, *44*, 2197–2210.

Crone, E. A., van Duijvenvoorde, A. C., & Peper, J. S. (2016). Neural contributions to risk-taking in adolescence—developmental changes and individual differences. *Journal of Child Psychology and Psychiatry*, *57*, 353–368.

Dahl, R. E. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. *Annals of the New York Academy of Sciences*, *1021*, 1–22.

D'Amico, E. J., & McCarthy, D. M. (2006). Escalation and initiation of younger adolescents' substance use: The impact of perceived peer use. *Journal of Adolescent Health*, *39*, 481–487.

Dishion, T. J., & Dodge, K. A. (2005). Peer contagion in interventions for children and adolescents: Moving towards an understanding of the ecology and dynamics of change. *Journal of Abnormal Child Psychology*, *33*, 395–400.

Do, K. T., Moreira, J. F. G., & Telzer, E. H. (2017). But is helping you worth the risk? Defining prosocial risk taking in adolescence. *Developmental Cognitive Neuroscience*, *25*, 260–271.

Dumontheil, I., Apperly, I. A., & Blakemore, S.-J. (2010). Online usage of theory of mind continues to develop in late adolescence. *Developmental Science*, *13*, 331–338.

Gardner, M., & Steinberg, L. (2005). Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: An experimental study. *Developmental Psychology*, *41*, 625–635.

Joinson, C., Kounali, D., & Lewis, G. (2017). Family socioeconomic position in early life and onset of depressive symptoms and depression: A prospective cohort study. *Social Psychiatry and Psychiatric Epidemiology*, *52*(1), 95–103.

Knoll, L. J., Fuhrmann, D., Sakhardande, A., Stamp, F., Speekenbrink, M., & Blakemore, S.-J. (2016). A window of opportunity for cognitive training in adolescence. *Psychological Science*, *27*, 1620–1631.

Knoll, L. J., Leung, J. T., Foulkes, L., & Blakemore, S.-J. (2017). Age-related differences in social influence on risk perception depend on the direction of influence. *Journal of Adolescence*, *60*, 53–63.

Knoll, L. J., Magis-Weinberg, L., Speekenbrink, M., & Blakemore, S.-J. (2015). Social influence on risk perception during adolescence. *Psychological Science*, *26*, 583–592.

Lam, C. B., McHale, S. M., & Crouter, A. C. (2014). Time with peers from middle childhood to late adolescence: Developmental course and adjustment correlates. *Child Development*, *85*, 1677–1693.

Logue, S., Chein, J., Gould, T., Holliday, E., & Steinberg, L. (2014). Adolescent mice, unlike adults, consume more alcohol in the presence of peers than alone. *Developmental Science*, *17*, 79–85.

Maxwell, K. A. (2002). Friends: The role of peer influence across adolescent risk behaviors. *Journal of Youth and Adolescence*, *32*, 267–277.

McCormick, C. M., Green, M. R., Cameron, N. M., Nixon, F., Levy, M. J., & Clark, R. A. (2013). Deficits in male sexual behavior in adulthood after social instability stress in adolescence in rats. *Hormones and Behavior*, *63*, 5–12.

Mills, K. L., Lalonde, F., Clasen, L. S., Giedd, J. N., & Blakemore, S.-J. (2012). Developmental changes in the structure of the social brain in late childhood and adolescence. *Social Cognitive & Affective Neuroscience*, *9*, 123–131.

O'Brien, S. F., & Bierman, K. L. (1988). Conceptions and perceived influence of peer groups: Interviews with preadolescents and adolescents. *Child Development*, *59*, 1360–1365.

Paluck, E. L., Shepherd, H., & Aronow, P. M. (2016). Changing climates of conflict: A social network experiment in 56 schools. *Proceedings of the National Academy of Sciences, USA*, *113*, 566–571.

Patton, G. C., Sawyer, S. M., Santelli, J. S., Ross, D. A., Afifi, R., Allen, N. B., . . . Viner, R. M. (2016). Our future: A *Lancet* commission on adolescent health and wellbeing. *The Lancet*, *387*, 2423–2478.

Peake, S. J., Dishion, T. J., Stormshak, E. A., Moore, W. E., & Pfeifer, J. H. (2013). Risk-taking and social exclusion in adolescence: Neural mechanisms underlying peer influences on decision-making. *NeuroImage*, *82*, 23–34.

Reniers, R. L., Beavan, A., Keogan, L., Furneaux, A., Mayhew, A., & Wood, S. J. (2016). Is it all in the reward? Peers influence risk-taking behaviour in young adulthood. *British Journal of Psychology*, *108*, 276–295. doi:10.1111/bjop.12195

Romer, D., Reyna, V. F., & Satterthwaite, T. D. (2017). Beyond stereotypes of adolescent risk taking: Placing the adolescent brain in developmental context. *Developmental Cognitive Neuroscience*, *27*, 19–34.

Sebastian, C., Viding, E., Williams, K., & Blakemore, S.-J. (2010). Social brain development and the affective consequences of ostracism in adolescence. *Brain and Cognition*, *72*, 134–145.

Shakespeare, W. (1969). *The winter's tale* (B. Maxwell, ed.). Baltimore, MD: Penguin. (Original work published 1623)

Somerville, L. H., Jones, R. M., Ruberry, E. J., Dyke, J. P., Glover, G., & Casey, B. J. (2013). The medial prefrontal cortex and the emergence of self-conscious emotion in adolescence. *Psychological Science*, *24*, 1554–1562.

Steinberg, L., Icenogle, G., Shulman, E. P., Breiner, K., Chein, J., Bacchini, D., . . . Takash, H. M. (2017). Around the world, adolescence is a time of heightened sensation seeking and immature self-regulation. *Developmental Science*. Advance online publication. doi:10.1111/desc.12532

van Harmelen, A.-L., Kievit, R. A., Ioannidis, K., Neufeld, S., Jones, P. B., Bullmore, E., . . . Goodyer, I. (2017). Adolescent friendships predict later resilient functioning across psychosocial domains in a healthy community cohort. *Psychological Medicine*, *47*, 2312–2322.

Van Hoorn, J., Van Dijk, E., Güroğlu, B., & Crone, E. A. (2016). Neural correlates of prosocial peer influence on public goods game donations during adolescence. *Social Cognitive & Affective Neuroscience*, *11*, 923–933.

Viner, R. M., Coffey, C., Mathers, C., Bloem, P., Costello, A., Santelli, J., & Patton, G. C. (2011). 50-year mortality trends in children and young people: A study of 50 low-income, middle-income, and high-income countries. *The Lancet*, *377*, 1162–1174.

Whitaker, L. R., Degoulet, M., & Morikawa, H. (2013). Social deprivation enhances VTA synaptic plasticity and drug-induced contextual learning. *Neuron*, *77*, 335–345.

Willoughby, T., Tavernier, R., Hamza, C., Adachi, P. J., & Good, M. (2014). The triadic systems model perspective and adolescent risk taking. *Brain and Cognition*, *89*, 114–115.

Yuen Loke, A., & Mak, Y.-W. (2013). Family process and peer influences on substance use by adolescents. *International Journal of Environmental Research and Public Health*, *10*, 3868–3885.