Physical activity (PA), or any bodily movement that results in energy expenditure, is one of the most-studied health behaviors in the field of health psychology. Exercise is a subset of PA that is planned and structured movement for the purpose of maintaining physical fitness or health (Buckworth, Dishman, O’Connor, & Tomporowski, 2013). Sedentary behavior, on the other hand, is distinct from PA and exercise as it is specific to time spent sitting, not just the absence of movement. The American College of Sports Medicine recommends that adults engage in a minimum of 150 minutes of moderate PA per week or a minimum of 60 minutes of vigorous activity per week, as well as resistance exercises 2–3 days per week (Garber et al., 2011). Despite such recommendations, many people worldwide do not participate regularly in PA and could benefit from higher levels of activity (Sisson & Katzmarzyk, 2008). Accelerometry data suggest that within the U.S., PA varies, with higher levels observed in Hispanic men and women (vs. white, black), with men being more active than women, and decreases observed with age for both genders across all racial/ethnic groups (Hawkins et al., 2009).

Benefits and Correlates of Physical Activity

**Health Benefits**

The beneficial effects of PA are well-documented, especially with regard to health and greater longevity (e.g., Loprinzi & Davis, 2015). Notably, there seems to be a significant dose-response relationship, with greater engagement in PA having the greatest benefit (Arem et al., 2015; Samitz, Egger, & Zwahlen, 2011). In addition to reduced risk for all-cause mortality, PA is specifically related to a reduced risk of mortality from cardiovascular disease (Shortreed, Peeters, & Forbes, 2013). Regular PA is also known to reduce the risk of developing several chronic illnesses, including cardiovascular disease and stroke, type II diabetes, obesity, certain types of cancers (in particular, breast and colon cancer) and osteoporosis (Reiner, Niermann, Jekauc, & Woll, 2013). Remarkably, PA is beneficial for primary and secondary prevention of 26 chronic diseases (Pedersen & Saltin, 2015). Thus, many people would benefit from engaging in PA to prevent chronic diseases and to treat existing chronic illnesses.
Stress Reactivity

PA’s beneficial effect of reducing the risk of mortality from cardiovascular disease has received substantial attention, in some measure, because of the link between cardiovascular disease and stress and PA’s capacity to offset reactivity to stressors. Although acute PA/exercise initially stimulates many of the same cardiovascular responses as psychosocial stressors, it does so without the harmful effects and via different mechanisms (e.g., parasympathetic withdrawal vs. sympathetic activity). Through continued PA, physiological adaptations (e.g., increased blood volume, reduced heart rate) yield a favorable reduced cardiovascular response to stressors—referred to as the cross-stressor adaptation hypothesis (Sothmann et al., 1996). Meta-analytic evidence has shown a favorable attenuated physiological reactivity and improved recovery from psychosocial stressors as a consequence of fitness/chronic exercise (Forcier et al., 2006). Somewhat contrary to this review, Jackson and Dishman (2006) found that cardiovascular fitness was associated with a small increase in stress reactivity to laboratory psychosocial stressors, though more physically fit individuals appeared to have a quicker recovery.

Recently, Ramirez and Wipfli (2013) performed separate meta-analyses of animal and human controlled aerobic exercise programs and found moderate effects for reductions in stress reactivity. In the analysis of chronic exercise with animals the major variables of influence were reductions in hormone and catecholamine reactivity to stressors; and in the human studies continued exercise resulted in lowered blood pressure reactivity. Even though the effects between exercise and reactivity may appear minimal (3.6 mmHg systolic blood pressure and 3.4 mmHg diastolic blood pressure), the reductions in reactivity may be of clinical importance over time.

Although the previous reviews emphasized more habitual PA, acute bouts of intense exercise (i.e., up to 75–80% of aerobic capacity) have also reduced cardiovascular reactivity to a stressor (Alderman, Arent, Landers, & Rogers, 2007). A meta-analytic review of acute aerobic exercise controlled trials revealed diminished stress reactivity for diastolic and systolic blood pressure with reductions of 3.0 mmHg and 3.7 mmHg, respectively (Hamer, Taylor, & Steptoe, 2006). The effects appeared stronger with moderate-to-vigorous exercise intensity lasting from 20 minutes to 2 hours with stressors administered up to 30 minutes following exercise. The effects of acute exercise may account for some of the mixed results with chronic exercise and reactivity because repeatedly engaging in exercise may more frequently place one in a post-exercise “window” when encountering daily stressors and result in diminished stress reactivity. Overall, high intensity exercise has been shown to reduce systolic and diastolic blood pressure and heart rate as well as to increase heart rate recovery. Reviews of the literature also suggest there is a need for increased methodological rigor, more ecologically valid stressors, and greater emphasis on examining the connection between exercise, reactivity, and clinical health outcomes.

Quality of Life, Mental Health, Mood, and Well-Being

Not surprisingly, PA is also known to promote mental health and well-being and its role in the prevention and treatment of depressive symptoms has been well studied. Evidence suggests that PA reduces the risk of developing depression (Mammen & Faulkner, 2013) as well as depressive and anxious symptoms in non-clinical populations (Rebar et al., 2015). Indeed, exercise is considered a safe and effective treatment for major depression (Kvam, Kleep, Nordhus, & Hovland, 2016) and equally effective as established treatments for anxiety (cognitive behavioral therapy and medication; Stonerock, Hoffman, Smith, & Blumenthal, 2015). PA is also associated with greater quality of life, health-related quality of life, positive mood, and psychological well-being in healthy and chronically ill adults (Bize, Johnson, & Plotnikoff, 2007; Pedersen & Saltin, 2015). Notably, PA may have
more benefit on quality of life for individuals who are well or in rehabilitation from a health event compared to patients exercising as part of a disease management program for a chronic condition (Gillison, Skevington, Sato, Standage, & Evangelidou, 2009). There is also a bidirectional relationship between acute bouts of PA and mood. That is, when people experience more positive mood states, they are more likely to be active over the next few hours, and after exercising are more likely to experience a positive mood for the next few hours (Liao, Shonkoff, & Dunton, 2015).

A related area, though examined less often, is the relationship between PA and self-esteem. Conceptualized as a multifaceted construct, self-esteem is organized in hierarchical levels (e.g., global self-esteem, physical self-esteem domain, situation-specific efficacy) within which lie several related subjective attitudes and beliefs about one’s self (e.g., physical condition, body attractiveness). Overall, engaging in PA appears associated with higher global self-esteem, with stronger relationships between perceived competence, physical self-esteem, and body attractiveness/perceived appearance existing in adolescence and extending into adulthood (Babic et al., 2014; Elavsky, 2010). Some data suggest that females may benefit more from participation in exercise than their male counterparts in terms of increased body image, physical self-esteem, and self-efficacy for exercise (Hausenblas & Fallon, 2006) and that improvements in physical self-worth and self-perceived physical condition help explain the effects of PA on depression (Legrand, 2014).

**Sleep**

Conventional wisdom suggests that PA is also beneficial for sleep. Evidence indicates that consistently high participation in PA/exercise is associated with better sleep quality, greater sleep duration, and a reduced likelihood of developing insomnia (Kline et al., 2013; McClain, Lewin, Laposky, Kahle, & Berrigan, 2014). However, these results are somewhat age and sex dependent, as moderate-to-vigorous PA is more beneficial for middle-aged adults and low-to-moderate activity is more beneficial for older adults in preventing insufficient sleep (Tsunoda et al., 2015). A recent meta-analysis suggests that acute bouts of PA have small, positive effects on total sleep time, reduced sleep onset latency, greater slow wave sleep, and reduced wake time after sleep onset (Kredlow, Capozzoli, Hearon, Calkins, & Otto, 2015). However, some studies have found that daily PA is not related to daily sleep in healthy adults (e.g., Youngstedt et al., 2003). Thus, there is some mixed evidence that PA may be beneficial for improved sleep.

**Cognition**

A growing body of research supports the beneficial effect of PA on cognitive performance in many domains across the lifespan. Meta-analyses of cross-sectional, longitudinal, and randomized controlled trials have found small-to-moderate effects for improved cognition (Colcombe & Kramer, 2003; Etnier et al., 1997; Smith et al., 2010), though these effects have been dependent upon the cognitive domain assessed (e.g., attention, executive function, memory). Roig, Nordbrandt, Geertsen, and Nielsen (2013), for instance, found small effects for short-term memory compared to negligible effects for long-term memory with chronic PA. Greater emphasis has been historically placed on examining cognition in older adults, with improved cognitive performance being most pronounced with simple reaction time/speed-based tasks and executive-control tasks (e.g., planning, response inhibition, task switching). Meta-analytic reviews indicate that routine PA may reduce cognitive decline over time as well as the risk of developing dementia (Hamer & Chida, 2009; Sofi et al., 2011). In children, PA is associated with better cognitive test performance (e.g., speed, accuracy), though findings with improved academic performance have been more mixed with controlled studies (Donnelly et al., 2016). Aerobic forms of PA have typically been emphasized in the literature; however,
combining aerobic and resistive/weight training exercise has shown enhanced gains in cognitive performance. The data does not support cardiovascular fitness as the mechanism for improved cognitive performance, but rather suggests the PA-cognition link is mediated via changes with cerebral structures (e.g., hippocampus; Maass et al., 2015) and growth factors (brain-derived neurotropic factor; Szuhany, Bugatti, & Otto, 2015).

**Personality**

Research examining the associations between PA and personality characteristics emphasizes the five-factor traits (extraversion, conscientiousness, neuroticism, openness, and agreeableness). Meta-analytic reviews show small positive associations with PA for extraversion and conscientiousness, and a small negative association with neuroticism (Rhodes & Smith, 2006; Wilson & Dishman, 2015). Less consistently, PA has been positively associated with openness and negatively related to agreeableness, with the latter link moderated by age and appearing to be accounted for by increases in agreeableness and declines in PA later in life (Wilson & Dishman, 2015).

Perhaps not surprisingly, facet traits have garnered increasing attention with excitement seeking, activity (extraversion) and self-discipline, industriousness/ambition (conscientiousness) showing larger effects than the higher-order personality traits (Rhodes & Pfaffli, 2012). An appeal to investigating the personality-PA association is the potential to develop and match intervention strategies to particular traits (Lepri, Staiano, Shmueli, Pianesi, & Pentland, 2016), though this area is still in the early stages of study. Research has attempted to examine the potential bidirectional associations between regular PA and personalities traits, though to this point the findings appear mixed (Allen, Magee, Vella, & Laborde, 2017; Stephan, Sutin, & Terracciano, 2014).

**Excessive Physical Activity**

Although numerous physical and mental health benefits may occur with habitual PA, some individuals may engage in exercise to the point of compromising these salubrious effects and experiencing harmful outcomes. Excessive exercise has been described in the literature for decades and comparisons have been made with substance use disorders (e.g., “exercise addiction”, “exercise dependence”). However, there remains no consensus on conceptualizing the phenomenon as some researchers have also considered excessive exercise within an obsessive-compulsive spectrum (“compulsive exercise”, “obsessive passion”) or as an eating disorder symptom (Lichtenstein, Hinze, Emborg, Thomsen, & Hemmingsen, 2017). A recent study found support for the proposal of primary and secondary forms of excessive exercise as opposed to framing it exclusively as an addiction, compulsion, or eating disorder symptom (Cunningham, Pearman, & Brewerton, 2016). The primary form aligned with addictive features and was more evident in males, whereas the secondary form appeared compulsive in nature and occurred more in females. Notably, the researchers concluded that it was not the amount or intensity of activity that characterized either primary or secondary forms of excessive exercise but rather the mindset with which individuals engaged with exercise.

Excessive exercise has been associated with overuse injuries, interference with work, interpersonal strain, depression, and anxiety (Landolfi, 2013; Lichtenstein et al., 2017). Rates for exercising excessively in the general adult population are thought to be about 0.5% (Monok et al., 2012), though some researchers have reported estimates as high as 34% (McNamara & McCabe, 2012). The extent of this phenomenon is thought to vary, in part, because of differences in gender, culture, and the divergent exercise samples examined, but also due to the inconsistency in defining excessive exercise (Lichtenstein et al., 2017).
Current Theories of Physical Activity

Transtheoretical Model

The Transtheoretical Model (TTM; Prochaska & DiClemente, 1983) is a stage-based theory of how people change health behaviors. In the context of PA, the individual would be going from inactive to regularly active. The stages are: precontemplation (not considering becoming more active); contemplation (aware of the problem with being inactive and considering becoming more active within the next 6 months); preparation (making plans to be more active within the next 30 days); action (actively trying to be more active); and maintenance (maintaining the new PA behavior for at least 6 months) (Nigg et al., 2011). Individuals can fall out of the stages at any time (relapse). A major contribution of TTM is that intervention techniques can be matched to individuals’ current stage to help them progress towards change. For example, providing information about the reasons to change could assist people in the precontemplation stage, but may be less relevant for people in the action stage. The major criticisms of TTM include the time frames of the stages, the use of discrete stages rather than a continuous process, and lack of studies examining the proposed temporal sequence (Nigg et al., 2011).

Nevertheless, there is evidence that TTM may be useful for understanding PA and behavior change. Stage-based classifications can predict whether a person is active or not-active and their intentions to engage in PA (Lippke, Zieglemann, Schwarzer, & Velicer, 2009). Not only is the stage predictive of concurrent PA, but it relates to more adaptive levels of PA one year later (Parker, Martin, Martinez, Marsh, & Jackson, 2010). Evidence also suggests that there is a differential relationship between stress and PA based on stage of change. Individuals in the maintenance stage respond to stress by engaging in more PA, whereas individuals in the other stages participate in less PA in response to stress (Lutz, Stults-Kohelmainen, & Bartholomew, 2010). A review of TTM-based PA interventions concluded that the majority of interventions did not adequately apply all key dimensions of TTM, and it was difficult to determine the efficacy of TTM (Hutchison, Breckon, & Johnston, 2009). Despite these limitations, TTM provides a useful framework for understanding PA change.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB; Azjen, 1991) posits that behavior is a result of conscious processes determining whether or not an individual will perform a behavior. In TPB, the primary predictor of behavior is intention to engage in the behavior. A large literature base exists examining TPB constructs in relation to PA. Most studies have found that people believe PA is good for physical and psychological health, and their normative groups are friends and family (Downs & Hausenblas, 2005). People also believe their control of exercise is limited by health issues, inconvenience, low motivation and energy, and low social support. A number of studies have demonstrated that TPB constructs are positively associated with PA. A recent meta-analysis of cross-sectional and longitudinal studies demonstrated that intentions have a large positive association with PA, followed by perceived behavioral control (medium-sized association), attitudes (medium-sized association), and subjective norms (small association) (Schüz. Li, Hardinge, McEachan, & Conner, 2017).

Despite the large association between intentions and PA, there remains a noticeable gap between intentions to engage in PA and actual behavior. A meta-analysis found that interventions to increase PA had moderate effects on intentions but weak effects on increasing PA behavior (Rhodes & Dickau, 2012). Thus, an increase in intentions does not necessarily translate into increased PA. Some evidence suggests that education (Schüz et al., 2017) and making action plans (Ferriera & Pereira, 2017) moderate the intention-behavior gap. A criticism of TPB is that it does not clearly outline how
intentions are translated into behavior, and perhaps extensions of the theory are needed to fill this gap (Sniehotta, 2009). This is an area for further inquiry within the study of TPB and PA.

**Health Belief Model**

The Health Belief Model (HBM; Rosenstock, 1974) weighs cognitive predictors of health behavior heavily, as it focuses on value expectancies (i.e., value one’s health, belief that the specific action will prevent/improve illness). The main constructs of HBM are described in more detail in Chapter 7 (Michie, 2018). In contrast to other health behaviors (e.g., screening), HBM has not been widely studied in relation to PA. A study of black college women showed that perceived barriers were higher and perceived severity, cues to action, and self-efficacy were lower in inactive women compared to active women (Juniper, Oman, Hamm, & Kerby, 2004). However, in a study of people with mental illness in Hong Kong, greater self-efficacy and fewer perceived barriers, but not perceived benefits, perceived susceptibility, or perceived severity, were related to PA (Mo, Chong, Mak, Wong, & Lau, 2016).

**Social Cognitive Theory**

Social Cognitive Theory (SCT; Bandura, 1991) explains how cognitive processes influence future behavior (see Michie, 2018). Bandura (2004) argues that self-efficacy is the main determinant of behavior, but also suggests that all the tenets need to be in place to create the precondition for change. SCT has been widely used to explain and intervene on PA behavior. Some studies estimate that SCT constructs (self-efficacy, social support, outcome expectancies, perceived barriers, and self-regulatory behavior—goals and plans) account for 17–71% of the variance in PA behavior (Ayotte, Margrett, & Hicks-Patrick, 2010; Heiss & Petosa, 2016; White, Wójcicki, & McAuley, 2012). Evidence suggests that interventions based on SCT constructs demonstrate small-medium effects on PA in cancer survivors (Stacey, James, Chapman, Courneya, & Lubans, 2015). However, interventions based on SCT may be no better than other theories (i.e., TTM or TPB) or interventions not based on theory in changing PA behavior (McDermott, Oliver, Iverson, & Sharma, 2016; Prestwich et al., 2014). This may not necessarily be due to the theory itself but rather the application and fidelity to the constructs into the intervention.

**Self-Determination Theory**

Self-Determination Theory (SDT; Ryan & Deci, 2000) is a theory of motivation that posits behaviors that are internalized/intrinsically motivated are more likely to be maintained than behaviors that are externalized/extrinsically motivated. Intrinsic motivation is defined as the “active engagement with tasks that people find interesting and that, in turn, promote growth” (Deci & Ryan, 2000, p. 233). Because motivation exists on a continuum, individuals can also be motivated to engage in PA for many reasons (e.g., “I exercise because it is a part of who I am [integrated regulation] but I would also feel guilty if I did not exercise [introjected regulation]”).

In a systematic review of studies examining the relations between SDT constructs and exercise, 91% of the studies found a positive association between autonomous regulations and exercise behavior (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). The vast majority of the evidence comes from cross-sectional studies demonstrating that people who report more internally regulated motivations also report greater participation in exercise and more positive psychological outcomes (e.g., Sebire, Standage, & Vansteenkiste, 2009). Targeting SDT’s hypothesized three basic psychological needs (autonomy, relatedness, and competence) increases internalized regulation and PA (e.g., Fortier et al., 2011; Silva et al., 2009). Additionally, several prospective longitudinal studies have demonstrated that...
basic psychological needs and autonomous motivation at time 1 are predictive of PA at time 2 (e.g., Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014). Thus, SDT seems to be a particularly promising theory to explain and intervene on PA behavior.

Social Ecological Model

Originally from developmental psychology, the Social Ecological Model (Bronfenbrenner, 1979) outlines the influences beyond individual factors such as availability of transport and policy on behavior. More recently, the theory has been applied to health behavior, and specifically to PA (Sallis, Owen, & Fisher, 2008). Social ecological variables account for a large proportion of the variance in PA. For example, 70% of the variance in active commuting is accounted for by individual, interpersonal, institutional, community, and environmental influences (Bopp, Kaczynski, & Campbell, 2013). Indeed, there is good evidence that the built environment is related to PA behavior. In a recent meta-analysis, PA was positively associated with neighborhood walkability, safety, access to destinations and services, recreational facilities, parks/public open space, shops and commercial destinations, greenery and aesthetically pleasing scenery, walk-friendly infrastructure, and access to public transport (Barnett et al., 2017).

Physical Activity Promotion and Interventions

Because of the numerous benefits attributable to PA and the low rates of participation in PA, public health professionals have for some time developed strategies and interventions to increase PA. A typical target of interventions has been for individuals to achieve at least 30 minutes of moderate intensity activity on five or more days per week, though some interventions have emphasized increasing low intensity PA (walking, stair usage) that may occur in natural environments or work settings.

Generally, evidence-based efforts to promote PA fall into one or a combination of levels ranging from the individual, group, or community context (Heath et al., 2012). Often individual-level interventions have focused upon changing attitudes, beliefs, intentions, and behaviors and within a theoretical framework (e.g., TPB, TTM). Historically, individual interventions have typically been delivered via face-to-face or telephone interactions and print materials; however, more novel modes of delivery through web-based and mHealth technologies (e.g., phones, tablets, tracking devices) have become widespread and appealing to individuals interested in modifying PA levels. Group-based interventions—often transpire in supervised settings (e.g., structured classes/programming). In addition to the theoretical frameworks seen within individual approaches, the group norms/identity and shared goals enable cohesion and support for PA participation.

In contrast to the individual- and group-level interventions, community interventions target large segments of a community or at-risk populations (e.g., children, Latinos). These interventions may focus upon a combination of built environments (e.g., sidewalks), particular sites (e.g., schools, faith-based settings, workplace), mass-media (e.g., television and radio campaigns), or policies (e.g., participation dependent insurance premium reductions). Although typically less intensive, community-level interventions access larger numbers of individuals who would not otherwise have been identified.

Many reviews of PA intervention studies are available, with some focusing more narrowly on intervention modalities, settings and/or targeted sub-populations (e.g., Ickes & Sharma, 2012). Generally, PA interventions, compared to either no-intervention or minimal-intervention controls, have resulted in modest gains (Muller-Riemenschneider, Reinhold, Nocon, & Willich, 2008). Not surprisingly, interventions promoting vigorous intensity PA and more structured activities are less effective in generating changes than those emphasizing lower intensity and active leisure pursuits (Williams, Matthews, Rutt, Napolitano, & Marcus, 2008). Meta-analytic findings have also shown that the behavioral change technique of self-monitoring appears to yield the greatest change in PA,
though delivery level (e.g., individual vs. group), number of sessions, target population, and setting were not significant factors related to effectiveness in this review (Michie, Abraham, Whittington, McAteer, & Gupta, 2009).

An increasing emphasis in the PA literature is being placed upon developing and evaluating interventions that are based on a theoretical framework. In a recent meta-analysis of randomized controlled trials, Gourlan and colleagues (2016) found a small-to-moderate beneficial effect ($d = 0.31$) for theory-based PA interventions. Although all the theories (SDT, SCT, TTM, and TPB) had a significant effect on PA, ranging from $d = 0.61$ (SDT) to $d = 0.26$ (TPB), no significant difference was found between the theories. Notably, interventions based on a single theory were more effective than those using a combination of theories. In line with this review, Taylor, Conner, and Lawton (2012) reported a small-to-medium effect for theory-based PA interventions conducted within worksites. Given the investment many individuals may feel towards their work, PA interventions at these locations have the potential for increased reach and exposure, as well as utilization of existing social networks (e.g., mavens) and built environments (e.g., stairwell enhancements).

Multi-component community-level interventions have demonstrated some effectiveness for increasing the percentage of active people across a variety of communities and populations (Heath et al., 2012; Zaza, Briss, & Harris, 2005). School-based programs have also shown benefits with increasing PA, though generalizability beyond the school setting has been restricted (Marcus et al., 2006). Overall, family-based interventions have had varied outcomes, and classroom-based health education have not been shown to be effective with increasing PA (Marcus et al., 2006).

Maintenance of PA change beyond 3 months is frequently unreported in interventions. The available evidence indicates that the mechanisms influencing initiation and maintenance of PA may not necessarily be the same. A recent review of PA interventions in older adults demonstrates the difficulty connected with maintenance of effects (Hobbs, Godfrey, & Lara, 2013). Although many of the interventions resulted in increased PA through the early phases, activity declined and returned to baseline levels at 18–24 months post-intervention. Importantly, maintenance of PA has been found to be enhanced when interventions continue for more than 6 months, include more than six behavioral change strategies, and incorporate face-to-face interactions and follow-up prompts (Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011).

Future Directions

Physical Activity Measurement

There are many aspects of PA that could be measured, including duration, frequency, intensity, and type of activity. Much of the research examining PA uses self-reported activity as the primary measurement. Although low-cost and easy to administer to large samples, self-report PA measures are subject to recall bias and over-reporting (Pruitt et al., 2006) and are known to have limited associations with objective PA measures (Troiano, Pettee Gabriel, Welk, Owen, & Sternfeld, 2011). However, asking participants to wear a measurement device, such as an accelerometer, could induce demand effects and participants may change their normal PA behavior. Despite this limitation, objective measurement of PA is the gold standard, and researchers should strive to use these methods when available and appropriate. As technology continues to advance, passive measurement of PA may become very useful. For example, pulling data from devices that people use daily, such as smart phones, activity watches, and active devices (e.g., Fitbit), may prove to be a useful source of information for better understanding PA behavior. Currently, the reliability and validity of these devices are limited, but this could be a potentially exciting area of further development and inquiry.
**Physical Activity and Health**

**Theory Integration**

There are over 80 theories of health behavior (Davis, Campbell, Hildon, Hobbs, & Michie, 2014), of which we presented six of the more commonly used theories. Theories can be generally divided into explanatory theories (e.g., TPB) or change theories (e.g., TTM), and only a few provide guidance on both explanation and change (e.g., SCT, SDT). Interestingly, efforts to code theoretically based behavior change techniques note significant overlap among the theories (e.g., self-efficacy is included in the HBM and SCT, but is similar to perceived behavioral control in TPB and competence in SDT) (Abraham & Michie, 2008). It is clear that no one theory is able to explain all PA behavior nor provide overarching guidance on how to encourage people to be more active. Some researchers have attempted to compare theories for explaining PA behavior (e.g., Rhodes, Plotnikoff, & Courneya, 2008), whereas others have attempted to integrate the theories into one (Hagger & Chatzisarantis, 2014). Unfortunately, interventions based on current theories have not provided a good test of their efficacy, as the theory may not have been used extensively to design the intervention (Prestwich et al., 2014). Thus, strong intervention studies are needed to fully test the mediating variables as proposed by the theories and to determine whether theory modifications are needed.

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