The number of people living with diabetes in the United States has steadily risen over the past 25 years, reaching a staggering count of 30.3 million people in 2015 (Centers for Disease Control and Prevention, 2017). Rising along with the prevalence of the disease are its financial costs. In 2013, direct and indirect (e.g., unemployment, work loss) costs of diabetes reached an all-time high of $245 billion (Centers for Disease Control and Prevention, 2017). Diabetes is now ranked as the 7th leading cause of death in the country and is associated with a host of health problems that pose serious threats to quality and quantity of life, including heart disease, kidney disease, nervous system disease, and lower limb amputation (Centers for Disease Control and Prevention, 2017). Preventing such complications hinges on adhering to a labor-intensive self-care regimen, involving changing one’s diet, physical exercise, monitoring blood glucose (blood sugar), and taking medication to control blood glucose levels. This is no easy task; managing diabetes requires considerable organization, self-discipline, focus, and emotion regulation on a daily basis.

Providing an overview of psychosocial and behavioral research in the area of diabetes is daunting, primarily because the literatures on type 1 diabetes (T1D) and type 2 diabetes (T2D) are vast and largely disparate from one another. T1D, years ago referred to as juvenile onset diabetes, occurs when the pancreas no longer produces insulin. Thus, insulin must be administered exogenously in order for the individual to live. A person with T1D has a labor-intensive self-care regimen: administering insulin multiple times a day through injections or an insulin pump; checking blood glucose levels multiple times a day; and adjusting the insulin dosage based on diet, exercise, and results of blood glucose checks. However, effective management can avoid short-term complications, such as hypoglycemia (too little blood sugar), as well as the long-term complications noted earlier. Although T1D is often diagnosed in childhood, with peak age of onset between 10 and 14 years (Mayer-Davis et al., 2017), about half are diagnosed in adulthood (Imperatore, Mayer-Davis, Orchard, & Zhong, 2017). This is one reason T1D is no longer referred to as juvenile onset diabetes. Across race and ethnicity, T1D is most likely to occur among non-Hispanic whites, although there is a recent trend toward increasing incidence among Hispanics (Mayer-Davis et al., 2017). The cause for this increase is unknown.

T2D, years ago referred to as adult onset diabetes, occurs when the body is no longer able to use insulin effectively, or what has been termed “insulin resistance.” T2D is often coincident with excess body fat. Treatment of T2D typically includes oral medication as well as diet and exercise to manage weight. It is not uncommon for persons with T2D to be treated with insulin after they have had the disease for many years and cannot maintain normal blood sugar levels (i.e., good glycemic control) with oral medication and life-style changes. T2D is typically diagnosed in adulthood, between the
ages of 45 and 64 (Centers for Disease Control and Prevention, 2017). However, T2D has become increasingly common among children in recent years, with ethnic minorities seeing the sharpest increase in incidence (Mayer-Davis et al., 2017). Unlike T1D, T2D is more common among ethnic minorities, in particular Native Americans, African Americans, and Hispanics (Centers for Disease Control and Prevention, 2017). Failure to effectively treat T2D can also lead to the myriad health problems later in life described earlier.

Given these distinctions, it may not be surprising that the literature on T1D has largely focused on children and the literature on T2D has largely focused on adults. In this chapter, we adopt a lifespan perspective in examining the psychosocial and behavioral research on diabetes by reviewing the large body of literature on children with diabetes that typically focuses on T1D, the more recent literature on emerging adults with diabetes that focuses on T1D, and the large literature on adults with diabetes that typically focuses on T2D.

Because effective management of both T1D and T2D rests on individual behaviors, research in this area has emphasized health behavior outcomes. Self-care behavior in children is far from optimal and consistently declines during adolescence (Helgeson, Siminerio, Escobar, & Becker, 2009). Among adults, adherence to medication, exercise, and diet are often poor (Gonzalez, Tanenbaum, & Commissariat, 2016). Diabetes research has also focused on psychological well-being. Psychological well-being is an important outcome in its own right and is directly linked to self-care and glycemic control (de Groot, Golden, & Wagner, 2016). Thus, this chapter focuses on both behavioral and psychological outcomes, recognizing that the two are synergistic and that both contribute to physical health. There is an extensive body of research on neurocognitive outcomes that we do not discuss but has been reviewed recently by Ryan, Duinkerken, and Rosano (2016).

**Theoretical Perspectives**

A wide array of theoretical perspectives has been applied to the study of diabetes, including the risk and resilience framework (Wallander & Varni, 1998), family systems theory (Patterson & Garwick, 1998), the social ecological model (Naar-King, Podolski, Ellis, Frey, & Templin, 2006), and social cognitive theory (Berg et al., 2011). In this chapter, we use self-determination theory as an organizing framework to synthesize existing research because many elements of other theories can be represented by self-determination theory.

Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000) is a broad theoretical framework aimed at identifying contexts that foster motivation for behavior regulation. Thus, it is ideal for understanding and predicting contexts conducive to the execution of diabetes self-care and, ultimately, improving psychological and physical health. SDT posits that contexts that facilitate motivation for regulated behavior will satisfy three basic psychological needs. First, one needs to feel effective and capable of carrying out the behavior or have a feeling of competence. Second, one needs to have a sense of control over one’s actions and choices, which is referred to as autonomy. Third, one must have a sense of belonging and connectedness, or relatedness. With respect to diabetes, we argue that contexts in which all three basic needs are met will be most conducive to self-care and psychological well-being.

In our review of the literature, we use this organizational framework to describe contexts that promote and undermine effective self-care and psychological well-being. That is, we describe research that is relevant to competence, autonomy, relatedness and their intersections. In doing so, we acknowledge that our review is not exhaustive, as every area of psychosocial diabetes research does not fit neatly within the SDT framework. We chose this framework because it captures many key areas of research on both children and adults. Although existing reviews of this area (Martire & Helgeson, 2017; Wiebe, Helgeson, & Berg, 2016) have used SDT as a way to synthesize the research, no empirical work has employed this theory as a guiding theoretical perspective.
We organize our review into three sections: children, emerging adults, and adults with diabetes. Within each section, we describe the research as it relates to competence, autonomy, and relatedness, and—where applicable—intersections among these needs. Following this review, we conclude with a brief description of key interventions that have been conducted with children and adults that can be understood within the SDT framework.

**Children With Diabetes**

Unless otherwise noted, the following section focuses on older children and adolescents with T1D. There is little research on younger children with T1D, in part because there is a lower incidence of diabetes in this age group, and in part because this literature focuses on parent stress and parental management of diabetes rather than the children themselves. Children under the age of 6 are not in charge of managing their own diabetes, and their disease management presents a number of unique challenges (Streisand & Monaghan, 2014). First, there are physiologic challenges as there is an increased sensitivity to insulin in this age group and a shorter honeymoon period after diagnosis (i.e., a period during which beta cells produce some insulin). Second, disease management is especially troublesome, as the unpredictability of children’s eating behavior and activity levels make it hard to determine insulin dosage. Third, young children lack the language and cognitive skills to communicate feelings of hypoglycemia and hyperglycemia. Fourth, it is difficult for parents to distinguish between normal behavioral problems (i.e., temper tantrums) and markers of hypoglycemia or hyperglycemia. Despite these challenges, disease management is especially important during this period of brain development, as poor disease management may increase the risk for later neurocognitive deficits.

There is a large literature that has examined variables relevant to older children’s and adolescents’ competence in managing diabetes and its accompanying links to self-care behavior, psychological well-being, and glycemic control. Because the regimen is complex, family members—in particular, parents—are notably involved, representing the relatedness factor of SDT. Autonomy for children is inextricably linked to the relatedness factor, as it is often family members who are or are not granting children the autonomy to manage diabetes. Thus, we present research relevant to competence, relatedness, and the intersection of relatedness with autonomy. (As an aside, we also note that autonomy intersects with competence, as the link of autonomy in managing diabetes to good diabetes outcomes depends on the child’s developmental capacity or competence; Wysocki et al., 2006).

**Competence**

Before competence to manage diabetes can be achieved, children must acquire a great deal of knowledge about diabetes. Without understanding target levels of blood glucose and the effects of behavior and physiology on blood glucose, self-care will be difficult. Research has shown that knowledge appears to be a necessary, but not sufficient, condition for good self-care (Gonzalez et al., 2016). Thus, diabetes knowledge may be an important antecedent to competence.

Particularly relevant to the SDT’s competence construct is self-efficacy, the perception that one is capable of engaging in the required behavior to manage diabetes. This construct, closely resembling competence, has been consistently linked to better self-care (Berg et al., 2011; Helgeson, Honcharuk, Becker, Escobar, & Siminerio, 2011) and better glycemic control (Hughes, Berg, & Wiebe, 2012). In one study, self-efficacy was associated with better glycemic control, especially when combined with the expectation of positive outcomes (Iannotti et al., 2006).

Another important factor relevant to competence in children with diabetes is self-control, which is the ability to manage and regulate one’s emotions and behavior. Like competence, self-control is about the perception one has the skills or capability to influence behavior. Among adolescents with
T1D, higher self-control has been linked to better glycemic control and has been shown to compensate for difficulties with processing emotions (Hughes et al., 2012). In a daily diary study, self-control buffered the relation between the number of diabetes problems and daily negative affect, such that relations were stronger for those who lacked self-control (Lansing, Berg, Butner, & Wiebe, 2016). Thus, self-control seems to be an effective resource that is linked to good physical health and buffers one from the adverse effects of diabetes problems.

**Relatedness**

Interpersonal factors that have been linked to good diabetes outcomes are relevant to SDT relatedness. Most often these factors focus on family relationships because children have limited competence and autonomy to carry out self-care independently. In young children, these relationships are examined via social interactions surrounding diabetes self-care. Several studies of young children with T1D have examined child-parent interactions during mealtime and found that problematic mealtime behavior has implications for glycemic control. For example, one study showed that child disruptive behavior was related to poor glycemic control, but problematic parental behavior (e.g., parental threats) was associated with a higher percentage of in-range blood sugar levels (e.g., Monaaghan et al., 2015). Thus, the implications of parent-child interactions for the health of very young children are complicated.

In older children and adolescents, research has linked a cohesive and expressive family environment and good family communication to good diabetes outcomes, whereas family conflict has been related to poor diabetes outcomes (Helgeson & Palladino, 2012). Although most of this research has been conducted on white middle-class families, families are known to play an especially important role in the lives of ethnic minorities and other collectivistic cultural groups. One study of a largely minority urban sample of adolescents with T1D showed that poor family relations were linked to poor self-care (Naar-King et al., 2006).

Peer relationships are an important part of fulfilling an adolescent’s need for relatedness. Whereas family members provide diabetes-related instrumental support, peers have been found to provide more diabetes-related emotional support (La Greca et al., 1995). However, the relation of friend support to diabetes outcomes is equivocal (Van Vleet & Helgeson, in press). One study showed that an aggregate measure of enjoyable interactions with friends over a four-day period was related to better self-care behavior (Helgeson, Lopez, & Kamarck, 2009), whereas another study linked friend support to deterioration in glycemic control over four years (Helgeson, Siminerio, et al., 2009). Friend support could be problematic in the context of diabetes to the extent that it indicates an involvement with peers that detracts from self-care (Van Vleet & Helgeson, in press). By contrast, conflict with friends—though less often studied—is clearly related to poor diabetes outcomes.

**Intersection of Relatedness and Autonomy**

The literature relevant to children’s autonomy is best understood within the context of relationships, specifically parental involvement in diabetes management. Parental involvement in diabetes decreases over adolescence, and this decline is associated with deterioration in self-care and glycemic control (Helgeson, Reynolds, Siminerio, Escobar, & Becker, 2008; Weibe et al., 2014). At first glance, parental involvement in disease management might seem to detract from child or adolescent autonomy. However, this is not necessarily the case. Shared responsibility for diabetes care activities is related to good outcomes, whereas parent-only or child-only responsibility is not (Helgeson et al., 2008). When parents and children work together or collaborate, youth cope more effectively with T1D (Berg et al., 2009) and are more likely to see an improvement in glycemic control (Gruhn, Lord, & Jaser, 2016). In contrast, parental overinvolvement, which likely poses a threat to autonomy, has
been related to lower self-efficacy and more depressive symptoms (Butler, Skinner, Gelfand, Berg, & Wiebe, 2007; Gruhn et al., 2016). Taken collectively, research has shown that parental involvement in diabetes management that is supportive of the child’s autonomy is linked to the best diabetes outcomes (Wiebe et al., 2016).

A Note on T2D in Children

As previously noted, the rate of T2D in children has increased dramatically over the past 20 years. The majority of work on children with T2D focuses on incidence and familial risk factors rather than psychosocial predictors of outcomes. Because the development of T2D is not as eventful as the onset of T1D (which is often linked to an acute hospitalization or emergency room visit), families may take the disease less seriously and even adopt a fatalistic attitude—that is, assume it was going to happen sometime in their lives regardless of their actions. T2D in children is similar in terms of physiology to T2D in adults and is often comorbid with obesity, but it is associated with an escalation of beta-cell deterioration (which are responsible for the production of insulin), and an increased rate of the development of complications (Nadeau et al., 2016). Additionally, because T2D disproportionately affects children who are disadvantaged by social status, race, and/or ethnicity, access to effective treatment is an important issue to consider. For all of these reasons, psychosocial research on T2D in children is sorely needed.

Emerging Adults and Type 1 Diabetes

Despite the fact that children with T1D grow up to become adults, there is much less research on adults with T1D. This is especially troublesome, given that the vast majority of those living with T1D are now adults (80–85%; Prime Group for JDRF, 2017). Over the last decade, there has been increased attention to youth with T1D who are on the cusp of adulthood, also known as emerging adults. Emerging adulthood is defined as the developmental period between the ages of 18 and 25 years (Arnett, 2000), a period that comes after childhood but before many traditional adult responsibilities are assumed (e.g., marriage, parenthood, independent living). Emerging adults with T1D face the same relational and vocational challenges that their peers without diabetes face, but they also face additional health challenges. Emerging adults with diabetes graduate from high school and decide whether to further their education or enter the labor force; separate from their families of origin and form attachments to peers, including romantic partners; and transition from the pediatric to the adult health care system. Each of these changing environments has implications for competence, autonomy, and relatedness.

Competence and Autonomy

The transition from the pediatric to the adult health care system is the subject of a growing body of research because it is associated with a number of difficulties that are relevant to competence and autonomy (Lyons, Becker, & Helgeson, 2014). Whereas the pediatric health care system is family-focused and provides integrated services, the adult health care system is patient-focused and assumes patients will be responsible for health care decisions. Problems erupt, in part, because youth are not prepared for this transition. The American Diabetes Association published a position statement to optimize the transition that suggested helping youth become more independent in managing diabetes, increasing their knowledge of the adult health care system, and preparing them for adult care (Peters & Laffel, 2011). All of these activities are aimed at instilling a sense of competence and facilitating autonomy, but within the context of a new relationship—the one between patient and adult health care provider.
In terms of relationships, there is evidence that parents remain an important influence in the lives of emerging adults. A longitudinal study that followed high school seniors for one year showed that parent support predicted enhanced psychological well-being, decreased smoking, and better self-care behavior, whereas parent controlling behavior predicted poorer psychological well-being and increases in smoking behavior (Helgeson et al., 2014). A follow-up of this sample at age 23 showed that parent knowledge of youths’ daily activities and feelings was linked to better self-care and glycemic control, and that this relation was mediated by reduced psychological distress (Helgeson et al., in press). Thus, similar to the literature on children and adolescents, emerging adults benefit both psychologically and behaviorally from having parents who are supportive and involved but not controlling, thus fulfilling the need for relatedness but not at the expense of autonomy.

In addition to the parent-child relationship, the emerging adult literature also places strong emphasis on the influence of peer and romantic relationships on self-care and well-being. In one study, friend conflict predicted increases in risk behavior and decreases in psychological well-being over one year, whereas friend support revealed few relations to outcomes (Helgeson et al., 2014). However, among those who were involved in romantic relationships, the nature of those relationships was a stronger predictor of health outcomes than friend relationships (Helgeson et al., 2015). Romantic partner support was related to enhanced psychological well-being, and romantic partner conflict was related to poorer psychological well-being and a decline in self-care two years later.

Despite having a likely history of shared involvement with parents for taking care of diabetes, young adults with T1D do not necessarily involve romantic partners in their care. One study of emerging adults (average age 25) showed that only 22% considered diabetes to be a shared problem between the self and romantic partner (Helgeson, 2017). Partner emotional support was linked to higher relationship quality and lower psychological distress, and was identified as the primary way in which partners were helpful. However, partner controlling behavior—a likely threat to autonomy—was linked to increased psychological distress. Most participants were satisfied with their partner’s level of diabetes involvement. Of the dissatisfied, more participants expressed a desire for increased rather than decreased involvement. Thus, although overinvolvement and threats to autonomy could be problematic for emerging adults with T1D, this study showed that the larger problem was a lack of partner involvement in self-care. One reason that participants were reluctant to involve their partners in diabetes management is that they were concerned with burdening partners.

### Adults With Diabetes

Like the literature on children with diabetes, the adult literature examines several factors relevant to competence, autonomy, and relatedness. The variables relevant to competence in children reviewed earlier—knowledge and self-efficacy—have parallels in the adult literature. However, competence here extends beyond managing diabetes to managing the health care system. In adults, the relatedness component of SDT has largely focused on romantic partners rather than other family members or friends. As was the case in the child literature, research relevant to autonomy intersects with relatedness as some partners’ attempts to be helpful can be controlling and, instead, undermine autonomy. The vast majority of research on adults with diabetes focuses on T2D, but some studies include adults with T1D.

### Competence

One factor that is relevant for fulfilling the need for competence among adults is health literacy and numeracy, which involves the ability to read health-related documents, write and complete health
forms, communicate about health, and use numeric information to make health care decisions. One cannot begin to manage diabetes successfully without having the skills to seek out and understand information and communicate effectively about diabetes. Thus, like diabetes knowledge in children, health literacy may be an antecedent to competence in adulthood. Health literacy has been linked to diabetes knowledge and good self-care behavior among adults with diabetes, but links to clinical outcomes, such as glycemic control, are less clear (Al Sayah, Majumdar, Williams, Robertson, & Johnson, 2013). Health literacy may be of particular concern among ethnic minorities due to language barriers and lack of health care access. However, most studies on health literacy control for race/ethnicity rather than directly examining whether race/ethnicity influences the link of health literacy to outcomes.

Another resource needed for competence in managing diabetes is self-control. Self-control can be construed as a resource that is needed to execute the myriad tasks associated with diabetes—and in this way, self-control is a resource that can be depleted. In support of this resource model of self-control, a 24-day daily diary study showed that a lapse in dietary adherence led to efforts to overcompensate for this lapse, which then predicted a greater chance of relapse and a quicker time to relapse (Jenkins, Rook, Borges-Garcia, Franks, & Stephens, 2016). The authors argued that overcompensation led to the depletion of resources.

Finally, the literature that is most directly related to the SDT need for competence is self-efficacy. There is a large literature among adults with T2D that links self-efficacy to better self-care, reduced psychological distress, and better glycemic control (Gonzalez et al., 2016). For example, a cross-sectional study of adults with T2D showed that self-efficacy and problem-solving skills were linked to better self-care, specifically healthier eating and greater physical activity (King et al., 2010).

**Relatedness**

The relationship most often studied in connection with T2D is the romantic partner relationship. Consistent with the literature on friends among children with T1D, partner emotional support appears to be more beneficial than partner instrumental support for daily mood and self-care (Helgeson, Mascatelli, Seltman, Korytkowski, & Hausmann, 2016). Thus, a warm and supportive environment may be more conducive to good diabetes management than concrete partner assistance with diabetes. This is consistent with SDT in that the need for relatedness involves the need to feel a sense of belonging and connection to others.

One theoretical perspective that is directly relevant to the relatedness aspect of SDT is communal coping (Lyons, Mickelson, Sullivan, & Coyne, 1998; Helgeson et al., in press). Communal coping involves the appraisal of a problem as shared and collaborative efforts to manage the problem. In a qualitative study of couples in which one person had T2D, focus groups revealed that patients were most likely to exercise when patients and spouses adopted a team approach to diabetes, shared responsibility, and had the sense that they were “in this together” (Beverly & Wray, 2010). These focus groups were addressing the two facets of communal coping, shared illness appraisal and collaboration. In a 14-day ecological momentary assessment study with 123 couples in which one person was recently diagnosed with T2D, daily reports of communal coping were related to better same-day mood and self-care behavior and predicted improved mood and self-care on the subsequent day (Zajdel, Helgeson, Seltman, Korytkowski, & Hausmann, in press). Finally, a behavioral measure of communal coping that reflected shared illness appraisal and collaboration was examined in the context of couples discussing a diabetes-related problem. This measure was linked to greater progress in resolving the problem as well as reduced diabetes distress and enhanced diabetes self-care (Van Vleet, Helgeson, Seltman, Korytkowski, & Hausmann, under review).

Communal appraisals also may maximize the support process among adult couples in which one person has T2D. A daily diary study showed that diet-related support was related to decreases
in diabetes–related distress when illness responsibility was appraised as shared but was unrelated to diabetes–related distress when illness responsibility was not shared (Stephens et al., 2013). A second study of adult couples in which one person had T1D corroborated this finding (Helgeson, Van Vleet, Kelly, Korytkowski, & Berg, 2017). There are parallel findings in the child literature: collaboration is most beneficial in the context of parent and child shared illness appraisal (Berg et al., 2009).

**Intersection of Relatedness and Autonomy**

Research relevant to autonomy is best understood within the relationship literature, as some partners engage in controlling behavior that could threaten patient’s autonomy. Daily diary research with adults with T2D has shown that diet–related pressure and controlling behavior from partners is related to an increase in patient distress and a decrease in dietary adherence (Helgeson, Mascatelli et al., 2016; Stephens et al., 2013). Among adults with T1D, partner overprotective behavior has been linked to worse self–care and poor glycemic control (Trief et al., 2017). Spouses who are overly involved or controlling might undermine patient autonomy.

The intersection between relatedness and autonomy also is relevant to cross-cultural research. Some cultures and ethnic minorities have beliefs and practices that may seem antithetical to personal control or autonomy. Ethnic minorities report having less faith in Western medicine and more fatalistic beliefs about the development and course of diabetes (Zeh, Sandu, Cannaby, & Sturt, 2014). In addition, religion plays an important role in coping with illness among ethnic minority groups, in particular African Americans (Naranjo, Hessler, Deol, & Chesla, 2012; Watkins, Quinn, Ruggiero, Quinn, & Choi, 2013). Religion can be viewed as inconsistent with autonomy, to the extent it involves placing control in the hands of a powerful other rather than the self. However, religious coping in these communities may be translated into a greater reliance on the family and the community for support with diabetes (Naranjo et al., 2012; Watkins et al., 2013). Thus, autonomy may be achieved within the context of relatedness. We noted earlier that families play a greater role in the lives of ethnic minorities and other collectivistic cultural groups in managing diabetes. This relatedness resource, however, is not without costs. These same cultural groups could be reluctant to involve family members, as they are sensitive to burdening network members (August & Sorkin, 2011).

**Interventions**

**Children With Diabetes**

Intervention work in the area of children with diabetes can be understood in terms of SDT. Anderson and colleagues’ (Anderson, Brackett, Ho, & Laffel, 1999) intervention for children with T1D targeted two components of SDT: autonomy and relatedness. They recognized that parental involvement in diabetes can undermine self–efficacy and autonomy, and developed an intervention to promote adolescent–parent teamwork and identify ways to solve problems without conflict. In the intervention, parents and youth discuss strategies for resolving diabetes problems that facilitate adolescent autonomy while maintaining parental involvement. Studies have linked this intervention to increased family involvement in diabetes, decreased family conflict, and improved glycemic control (Anderson et al., 1999; Laffel et al., 2003).

The second major intervention applied to families of children with T1D is Behavioral Family Systems Therapy. This intervention targets competence via problem–solving training; relatedness by fostering communication between youth and parents, reducing conflict, and improving overall family functioning; and autonomy by encouraging youth to make decisions about when to ask parents for assistance. This intervention has been linked to improved family communication, enhanced
problem-solving skills (Wysocki et al., 1999), improved self-care behavior, and better glycemic control (Wysocki et al., 2007).

More recently, a novel intervention has been developed to target youth with T1D, known as FL3X (Mayer-Davis et al., 2015). FL3X reflects a flexible life-style intervention that consists of motivational interviewing, problem-solving, diabetes education, and enhancing family communication and teamwork. FL3X differs from previous research in that the treatment is tailored to the individual. Autonomy is facilitated by having youth create goals and learn to take control of diabetes. Competence is instilled by having teens identify specific barriers to adherence and generate possible solutions. Motivational interviewing is used to create a collaborative environment between children and parents to facilitate self-care behavior. The frequency of sessions is in direct response to changes in glycemic control. Although the results of the trial are not in, preliminary data indicate high acceptability and retention, and pilot data show an improvement in glycemic control and quality of life.

Increasingly, interventions aimed at youth with T1D involve technology. The use of text messaging and other smartphone capabilities has expanded the ways of reaching youth with T1D (Gonder-Frederick, Shepard, Grabman, & Ritterband, 2016; Hilliard, Powell, & Anderson, 2016). Although these technologies present the opportunity for patient-tailored interventions and may be more appealing to youth than conventional face-to-face interventions, the jury is still out as to their effects on diabetes outcomes.

**Adults With Diabetes**

The Diabetes Prevention Program is a landmark trial of a behavioral intervention aimed at reducing the risk of T2D. Adults (45% ethnic minorities) over 25 years old (M = 51) at risk for T2D (i.e., impaired glucose tolerance) were randomly assigned to one of three conditions: life-style intervention, medication (metformin), or placebo drug. The life-style intervention was tailored to the individual and consisted of multiple resources relevant to SDT: supervised exercise sessions and a flexible maintenance program, a “toolbox” of self-management strategies tailored to each person’s barriers to adherence, and a life-style coach to deliver the intervention. Compared to placebo, the life-style intervention resulted in a significant 58% reduction and the metformin group resulted in a significant 31% reduction in diabetes incidence over a three-year period (Diabetes Prevention Program Research Group, 2002). Ten-year follow-up showed a 34% reduction in the life-style intervention and an 18% reduction in the metformin group compared to placebo (Diabetes Prevention Program Research Group, 2009). There have been many translations of the DPP, often of smaller magnitude, to high-risk groups in the community that show success with more modest effects.

The Look AHEAD program targeted overweight or obese individuals with T2D. It consisted of group meetings and individual counseling sessions targeted at weight loss (goal was to achieve 7% or more weight loss with a dietary plan tailored to each individual) and increased physical activity (goal was to increase to a minimum of 175 minutes a week). Intervention components enhanced competence by providing behavioral techniques to change diet and exercise habits and may have enhanced relatedness by providing support from counselors and peers during group meetings. Results showed an increase in weight loss, an improvement in glycemic control and blood pressure, and better quality of life in the intervention group compared to controls (Look AHEAD Research Group, 2013; Williamson et al., 2009).

Other recent promising interventions relevant to SDT include a four-month behavioral intervention delivered by phone to adults with T2D (Trief et al., 2016). In an effort to examine whether delivery that focused on the couple (which may fulfill the need for relatedness) would have the maximum benefits, participants were randomized to one of three conditions: (1) couples jointly received behavioral intervention phone calls, (2) individuals with T1D received behavioral intervention phone calls, and (3) a control group that received diabetes education phone calls. There were
no overall group differences in glycemic control, but those in the couple intervention showed the greatest benefits on psychosocial outcomes, such as diabetes distress, and both interventions showed benefits in self-efficacy compared to the control condition.

Many interventions for adults with T1D and T2D now involve the use of digital technology to improve self-care and well-being (Gonder-Frederick et al., 2016). In particular, the use of telephone and telemedicine make it easier to reach populations that are less mobile and/or have less access to health care. Hundreds of mobile applications for diabetes have been developed, often focusing on blood glucose control, diet, and overall self-care behavior. However, few of these apps are evidence-based, and their effect on diabetes health is equivocal.

**Summary and Conclusions**

The psychosocial research on T1D and T2D among children, emerging adults, and adults shows that meeting needs for competence, autonomy, and relatedness are likely to facilitate good health behaviors and maximize psychological well-being, both of which are connected to good physical health. Children need to acquire the knowledge and skills to manage diabetes, but show the best diabetes outcomes when they collaborate with parents to manage their disease. These findings hold through later adolescence, and, in fact, parents remain an important influence on diabetes outcomes among emerging adults. Knowledge and skills are essential for good disease management among adults. Here interpersonal resources involve romantic partners, family members, and the health care team. Regardless of age, optimal interpersonal resources are ones that provide support and facilitate autonomy while not undermining competence. For these reasons, SDT is a useful framework within which future research in this area can be examined.

Future research in the area of diabetes should attend to less studied groups—specifically, children with T2D and adults with T1D—and invest resources in examining under-represented cultural and racial groups who are at higher risk of T2D and may be at higher risk of poor diabetes outcomes. It is important to understand the varied cultural and social norms that might impact how people manage diabetes and respond to personal (e.g., diabetes education) and interpersonal resources (i.e., seeking and accepting help). In addition, future research should expend more effort examining relations of both children and adults with diabetes to their health care providers, as those relations are likely to have implications for competence, relatedness, and autonomy.

**References**


Diabetes


Diabetes


