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Developmental differences in reported overparenting, autonomy, and glucose monitoring within a medical specialty camp context

Ryan J. Gagnon
Barry A. Garst
Leslie E. Heffington
Department of Parks, Recreation, and Tourism Management, College of Behavioral, Social, and Health Sciences, Clemson University, Clemson, SC, USA

Abstract

Developmentally inappropriate and excessive parenting can manifest at higher levels in children with Type 1 diabetes (T1D). A child's age, level of T1D training, and time since T1D diagnosis have been associated with higher levels of developmentally excessive parenting (i.e., overparenting), lower rates of autonomy granting, and lower rates of continuous glucose monitoring (CGM). Utilizing a structural equation model, the present study examined these associations with data collected from a medical specialty camp (MSC) serving 262 youth with T1D. Respondents primarily identified as female (59.5%), were an average 13.83 years old, and had attended the MSC for an average of 3.72 years. Respondents had an average of 5.95 years since T1D diagnosis, an average of 2.62 years utilizing a CGM, reported checking their CGM data an average of 12.75 times per day, and an average of 12.02 parent CGM checks per day. As youth age increased, rates of overparenting decreased. Similarly, youth with more MSC experience reported lower rates of overparenting. Contrary to the study hypotheses, overparenting had a positive effect on autonomy granting. Finally, a negative relation was found between years with T1D and average CGM checks, consistent with the broader T1D literature where adherence to diabetes management tends to decline in parallel with youth experience level managing T1D.

Keywords

overparenting, helicopter parenting, parenting, diabetes, glucose monitoring, chronic illness, youth

Introduction

When at developmentally appropriate levels, parenting that is encouraging, involved, and autonomy supportive tends to result in positive short- and long-term outcomes for a child (Baumrind, 2005; Darling & Steinberg, 1993). However, when these practices are persistently misaligned with a child's developmental needs, they may reflect *overparenting* (Segrin et al., 2012). *Overparenting* represents a form of well-intended parenting characterized by excessive levels of parent support, control, and problem-solving (Gagnon et al., 2021), accompanied by high levels of parental risk aversion and lower rates of autonomy support (Burke et al., 2018). While the motivations for a parent to engage in overparenting behaviors are multifaceted, such behaviors are generally employed to ensure the very best possible short- and long-term outcomes for their child (Segrin et al., 2015). Indeed, with escalating pressures for children to excel in increasingly competitive academic, athletic, and social spaces, overparenting represents a logical response from parents to ensure their child has the best opportunity to succeed (Liu et al., 2019).

Beyond the need to successfully navigate increasingly challenging settings, a child's individual characteristics may also increase the likelihood of overparenting. Some literature suggests overparenting emerges at greater levels in parents of children with a disability when compared to parents of children without a disability (Gagnon et al., 2020; Harris et al., 2008). However, given the diverse ways disability can be experienced, the simple presence and/or absence of a disability does not necessarily suggest the distribution of overparenting among parents of children with a disability is uniform. Indeed, in some instances, the excessive behaviors reflected in overparenting (e.g., excessive advocacy, involvement, and control) may be advantageous for a child with a disability and result in better health outcomes (Berg et al., 2011). Thus, the present study examines overparenting within the context of a prevalent chronic illness effecting youth, Type 1 Diabetes (T1D). As one of the most common chronic illnesses for youth under 20 years of age, T1D represents a serious health challenge for afflicted youth and a correspondingly significant responsibility for their parents (Basina & Maahs, 2018; Divers et al., 2020; Landers et al., 2016). Furthermore, as indicated by the increasing prevalence of T1D among youth under 20 years old (Divers et al., 2020), the examination of which factors promote positive outcomes for a child is important to inhibit serious and potentially fatal outcomes for children living with T1D.

Type 1 Diabetes and Parenting

T1D is a disability where the afflicted person's insulin-producing cells are destroyed (Atkinson et al., 2014). This reduction/absence of insulin prevents glucose (i.e., blood sugar) from entering cells and correspondingly leads to excessive accumulation of glucose in the blood, potentially resulting in serious health consequences, hospitalization, and premature death (Maahs et al., 2010). As such, the monitoring of glucose levels represents a crucial factor in properly managing T1D (Datye et al., 2021). While few methods to assess glucose levels exist (e.g., finger pricks with test strips), an increasingly

normative approach is to employ continuous glucose monitors (CGMs) to automate much of the T1D management process. A CGM typically employs a small sensor inserted under the skin to test glucose levels at regular intervals (e.g., every 5 minutes). CGMs can then be paired with multiple smart phones to facilitate parental remote monitoring of a child's T1D health (Welsh, 2018).

When used consistently, CGMs have been associated with improved health outcomes for children with T1D (Chase et al., 2010), reduced levels of parental stress (Burckhardt et al., 2018), and greater rates of reported independence, freedom, and confidence from both the parent and child's perspective (Pickup et al., 2015). With the ability to remotely monitor a child's T1D health, CGMs offer parents a mechanism to reduce the levels of required conventional blood glucose checks (e.g., finger pricks and test strips) and the remote monitoring of glucose levels via a CGM may also result in a child's improved T1D health. For instance, Welsh et al. (2019) found children who have additional "followers" (e.g., parents, friends) on their CGM beyond themselves maintain better glycemic control. However, this remote observation of glucose levels may also result in developmentally excessive levels of parental monitoring (Pickup et al., 2015). In a study of adolescents and parents utilizing CGMs to manage T1D, youth reported that parents frequently over monitored their CGM data and inhibited their feelings of independence and autonomy (Rashotte et al., 2014). Similar research also suggests parents may excessively, control, and/or micromanage their child (Fremont & Miller, 2021), behaviors frequently associated with overparenting (Love et al., 2022). Developmentally inappropriate rates of parental involvement are associated with poorer adherence to critical components of T1D management that can lead to serious health consequences when absent (Harris et al., 2008; King et al., 2014).

Type 1 Diabetes and Overparenting

Given most T1D diagnoses occur prior to or during adolescence (Maahs et al., 2010), parents play a critical role in establishing quality T1D management in their child. Indeed, developmentally appropriate parenting is strongly associated with successful T1D outcomes (Berg et al., 2017; Feldman et al., 2018; Wu et al., 2014). However, within the context of adolescence, chronic illnesses like T1D represent an additional hurdle to successful development, as youth face both the typical challenges of this developmental period (e.g., independence seeking, identity formation, autonomy development, self-determination; Deci & Ryan, 2000), compounded by difficulties associated with managing their illness (Comeaux & Jaser, 2010; Rashotte et al., 2014). Additionally, adolescence often parallels increased rates of T1D-related emergency room and unplanned hospital visits (Klostermann et al., 2021), which may present yet another obstacle for adolescents diagnosed with T1D.

When developmentally appropriate, the management of a child's T1D will gradually shift from the parent being directly responsible for the child's T1D management to one where the child is primarily accountable for their own care (Kelly & Berg, 2021). More specifically, as a young person matures in their time since T1D diagnosis (TSD), and as they experience more T1D training, the child will typically assume more responsibility

over their own care (Comeaux & Jaser, 2010; Erie et al., 2018; Schilling et al., 2006). However, when this shift in responsibility does not occur and the levels of parental involvement and control remain higher than essential (and thus developmentally inappropriate), this excessiveness can inhibit child-reported levels of comfort, autonomy, and skill to independently manage their illness (Berg et al., 2011; Young et al., 2014). Moreover, these excessive parental behaviors may increase negative outcomes when the child is outside of parental supervision, as the child may not have the skills to resolve issues without parental support (Kelly & Berg, 2021; Viklund & Wikblad, 2009).

Thus, an understanding of overparenting is crucial to mitigate unique challenges associated with T1D, but also the broader consequences of these developmentally inappropriate behaviors. More precisely, overparenting has been associated with lower levels of overall child well-being (Kouros et al., 2017), higher levels of child anxiety and depression (Schiffrin et al., 2014), lower levels of child adjustment (Burke et al., 2018), poorer rates of socioemotional function (Luebbe et al., 2018; Segrin et al., 2015), lower self-esteem (Liu et al., 2019), and lower rates of autonomy (Gagnon & Garst, 2019). The negative relation between autonomy and overparenting (Cui, et al., 2019; Padilla-Walker & Nelson, 2012) is especially pertinent within a diabetes context, as autonomy supportive parenting is not just an important condition for optimal T1D outcomes, it is fundamental (Berg et al., 2017; Kelly & Berg, 2021).

Child Age, Overparenting, and Medical Specialty Camp

The age of the child, the child's time since T1D diagnosis (TSD), and the child's experiences cultivating T1D skills represent factors that can impact rates of overparenting and autonomy support (Erie et al., 2018; Klostermann et al., 2021). For example, in a study of T1D skill development in youth, Schilling et al. (2006) highlighted how in normative circumstances, parental involvement tended to decline as the child increased in age and TSD. When parents violated this transition and overinvolved themselves, conflict tended to arise, often to the detriment of the child's T1D. Similarly, in a study examining college students, both Kouros et al. (2017) and Rote et al. (2020) found overparenting tended to decrease for children as they increased in age. These negative associations may suggest the excessive behaviors associated with overparenting tend to reduce as the child matures.

This potentially inverse association is also demonstrated between parental autonomy support and child maturation (Martinek et al., 2016; Wiebe et al., 2014). In a sample of youth with T1D, Hanna et al. (2012) illustrated both parent and adolescent reports of autonomy support were negatively related to child age. Beyond a child's level of maturation and TSD, another factor that may influence overparenting and autonomy supportive behaviors are the skills and training a child possesses to self-manage their care. One context particularly effective for developing these skills is medical specialty camps (MSCs) (Hill et al., 2015). Programs provided during MSCs can enhance disability specific knowledge, competence, and confidence (Gillard & Allsop, 2016). Moreover, repeated experiences at MSCs have been associated with greater T1D adherence (e.g., monitoring CGMs), long term glycemic control, and T1D self-efficacy (Barone et al., 2016; Wang et al., 2008). The skills cultivated from these experiences have been

associated with greater levels of parental confidence in their child to self-manage their T1D independent of their intensive oversight (Weissberg-Benchell et al., 2019). As such, these MSC experiences may reduce the rates of observed overparenting behaviors.

The Present Study

T1D represents a serious and growing chronic health challenge for youth and a significant responsibility for parents (Basina & Maahs, 2018; Divers et al., 2020). Parents play a key role in supporting their child's TID management (Landers et al., 2016). However, when parental involvement becomes excessive (i.e., overparenting), negative outcomes may result (Gagnon et al., 2020; Young et al., 2014). A child's use of a CGM presents an avenue for overparenting behaviors to emerge in a digitally centered context in which youth can become over-monitored and correspondingly fail to develop necessary diabetes management independence (Viklund & Wikblad, 2009). Medical specialty camps (MSC) enable youth to build knowledge and skills to autonomously manage their illness in a supportive, community-based setting (Gillard et al., 2022; Wang et al., 2008). While MSC program-level factors influencing youth outcomes have received research attention (Barone et al., 2016; Gagnon et al., 2019), the individual, family, and context-level characteristics that may influence parental behaviors and youth TID management are less clear. Partially informed by self-determination theory (i.e., excessive parental behaviors are negatively associated with supportive and developmentally appropriate parenting) (Deci & Ryan, 2000), the present study examined the influence of these factors on overparenting, autonomy granting, and CGM monitoring.

The proposed study consists of six hypotheses (see Table 1), where increased levels of child age (H1A-D), child medical specialty camp experience (H2A-D), child years with T1D (H3A-D), and child years of experience using a CGM (H4A-D) will have a negative effect on reported levels of overparenting, parental autonomy granting, average daily CGM self-checks, and average daily parental CGM checks. Similarly, we hypothesize overparenting will have a negative effect on parental autonomy granting and average daily CGM self-checks (H5A-B), but a positive effect on average daily parental CGM checks (H5C). Finally, we hypothesize parental autonomy granting will have a positive effect on average daily CGM self-checks (H6A) and a negative effect on average daily parental CGM checks (H6B).

Method

Setting

The partner organization in this study is a non-profit medical specialty camp (MSC) in Georgia (United States), specifically serving children with T1D. The camp's mission focuses on education, empowerment, and normalization of T1D with afflicted youth and their families. The 5-day residential summer camp experience is facilitated by medical professionals and staff trained in both T1D management and delivery of high quality out-of-school-time experiences. Campers participate in a variety of traditional residential summer camp activities (i.e., archery, swimming, crafts, skits, horseback riding, fishing)

Table 1. Hypothesized Effects.

Hypothesis number	Predictor variable	Hypothesized effect →	Dependent variable
H1A	Child age	Negative	Overparenting
H2A	Child camp experience	Negative	Overparenting
H3A	T1D years	Negative	Overparenting
H4A	Child years with CGM	Negative	Overparenting
H1B	Child age	Negative	Autonomy granting
H2B	Child camp experience	Negative	Autonomy granting
H3B	T1D years	Negative	Autonomy granting
H4B	Child years with CGM	Negative	Autonomy granting
H5A	Overparenting	Negative	Autonomy granting
H1C	Child age	Negative	CADCGM
H2C	Child camp experience	Negative	CADCGM
H3C	T1D years	Negative	CADCGM
H4C	Child years with CGM	Negative	CADCGM
H5B	Overparenting	Negative	CADCGM
H6A	Autonomy granting	Positive	CADCGM
H1D	Child age	Negative	PADCGM
H2D	Child camp experience	Negative	PADCGM
H3D	T1D years	Negative	PADCGM
H4D	Child years with CGM	Negative	PADCGM
H5C	Overparenting	Positive	PADCGM
H6B	Autonomy granting	Negative	PADCGM

Note: Child Camp Experience = Total Years of Child Attending Study Site Camp; T1D Years = Child's Reported Years Diagnosed with Type 1 Diabetes; Child Years with CGM = Child's Reported Years using a Continuous Glucose Monitor; CADCGM = Child Average Daily Self-Checks of Continuous Glucose Monitor; PADCGM = Child Reported Average Daily Parental Check of Continuous Glucose Monitor.

in parallel with sessions associated with the management of their T1D (e.g., managing blood glucose, calculating insulin dosage, self-administering medications). Youth are primarily referred to the camp from their healthcare provider(s) (e.g., primary care physician, endocrinologist, school nurse), from other parents whose child has T1D (i.e., social media parent groups, parent supports groups), and from school nurses.

Participants and Data Collection

As part of a larger study examining the potential socioemotional and health benefits of medical specialty camps (MSCs), data were collected in the summer of 2021 from 262 youth attending the study site, specifically youth who utilized a CGM to manage their T1D. Youth were recruited into the study by the camp administrators with approval from their parents. Before data were collected, this study was approved by [redacted for review]'s Institutional Review Board, and youth participation in the study was supported by parental notification and child assent. Prior to the initiation of their camp experience,

respondents completed a paper questionnaire administered by a trained member of the research team. The questionnaire was comprised of demographic items, the child's experience level with T1D, the strategies they employ to manage their T1D, over-parenting, and parental autonomy granting. Of the total eligible sample, 262 out of 267 campers opted to participate, indicating a 98.12% response rate. Campers who provided their gender primarily identified as female (59.5%; male = 38.5%; non-binary = 1.6%), were an average 13.83 years old (*SD* = 2.01; *Mdn* = 14, Range = 10–18 years), and had attended the medical specialty camp for an average of 3.72 years (*SD* = 2.35). Campers who provided their race primarily identified as either white (64.2%), African American (16.5%), multi-Racial (8.8%), Hispanic or Latino Origin (5.4%), or Asian origin (1.6%). Campers reported an average of 5.95 years being diagnosed with T1D (*SD* = 3.54) and an average of 2.62 years (*SD* = 2.03) utilizing a CGM.

Measures

Continuous Glucose Monitor Checks. To assess parental and child checks of CGMs, campers reported on how many times a day on average they checked their CGM levels (*M* = 12.75, *SD* = 11.79, Range = 0–51) and how many times per day their parents checked their CGM levels (*M* = 12.02, *SD* = 14.42, Range = 0–51). As part of the data diagnostics process, the self-reported checks of CGM data were examined for extreme scores. This examination identified 12 respondents who indicated extremely high scores on either CGM self-checks (range = 54–300) and/or parental CGM checks (range = 72–288), that were excessive as indicated by box-plot analyses and prior studies of reported CGM checks (Erie et al., 2017). Rather than simply removing these respondents from the data set, their scores were transformed to equal 51 (the high range of all other reported values).

Overparenting. To assess overparenting, a modified version of the Gagnon et al. (2020) overparenting scale was employed. Specifically, the items were reframed from the parental perspective to the child's perspective (e.g., changing *I solve any crisis or problem my child might have* to *My parents solve any crisis or problem I might have*). Respondents were asked to report their level of agreement with 12 items on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale, where higher levels indicated higher rates of overparenting. Paralleling the approach of Gagnon et al. (2020), overparenting was modelled as a second order factor reflecting three-first order factors: (1) Excessive Control (e.g., *my parents manage most important decisions in my life*), (2) Excessive Support (e.g., *when I'm engaged in an important task or project, my parents do some of it for me*) and (3) Excessive Problem Solving (e.g., *when something goes wrong in my life, my parents jump in to take care of it*). After measurement testing and model modification, the second order overparenting factor illustrated acceptable psychometric properties (described in more detail in proceeding sections) and internal consistency (α = .908).

Autonomy Granting. To assess youth observed levels of parental autonomy granting (e.g., parent provision of independent decision making), the 4-item autonomy granting scale of Kunz and Grych (2013) was employed. Respondents were asked to rate their level of

agreement on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale (e.g., *My parents are receptive to things I say*), where higher scores indicated greater levels of autonomy granting. Beyond the psychometric testing described in the proceeding sections, the 4-item scale exhibited acceptable levels of internal consistency ($\alpha = .823$).

Data Preparation and Analysis

Prior to analyses, the data were screened for multivariate outliers employing a combination of Mahalanobis distance and the chi-square distribution function, which identified no outliers within the data set. Next, the data were examined for normality and missingness utilizing the MissMech package (v. 1.0.2; Jamshidian & Jalal, 2010) in RStudio (v 1.4.1717). The significant results of this analysis indicated the data were non-normal in their distribution (modified Hawkin's test, $p < .001$). To account for this non normality, a robust estimation technique was employed (i.e., maximum likelihood robust; MLR). The data were then examined for potential systematic causes of missingness (i.e., Missing Not at Random; MNAR) which indicated data were missing completely at random (MCAR), but there was no evidence of heteroscedasticity across the measured variables ($p = .238$). As such, a full information maximum likelihood (FIML) technique was employed to manage missing values in testing of the measurement and structural models.

For the testing of the measurement model and study hypotheses latent modelling techniques were employed. Specifically, the psychometric properties of the study measures were tested through confirmatory factor analyses (CFA) and the hypotheses were tested through a SEM in Lavaan (version 0.6–8; Rosseel, 2012). These latent techniques provide several advantages relative to other approaches (e.g., hierarchical multiple regression, MANOVA). Specifically, latent models do not ignore measurement error, or in the case of multiple regression assume perfect measurement (see also Brown, 2015). Rather, measurement error becomes an embedded component of the model (Westfall & Yarkoni, 2016), thus reducing potential type 1 error. Moreover, latent models allow for multiple hypotheses to be tested in concert, again reducing potential rates of type 1 and/or type 2 error associated with analyses requiring multiple tests across multiple dependent and predictor variables (Loehlin & Beaujean, 2017).

To assess model fit for the CFA and SEM, the models were tested using robust fit indices including the Tucker-Lewis Index (TLI) and the Comparative Fit Indices (CFI), where values closer to one typically indicate the proposed model is a better fit than a null model (see also Kline, 2016). To estimate how close the model(s) were to a perfect fit, the RMSEA (i.e., root mean squared error of approximation) and its 90% confidence interval were utilized where values closer to zero are preferable (i.e., RMSEA < .07). Notably, the selected indices were not based exclusively on data driven criteria (e.g., TLI = .80 is unacceptable vs. TLI = .90 is acceptable), rather they were informed from past performance of the selected scales in combination with data from the present study (Kline, 2016; Marsh et al., 2004). As part of the CFA process, the item loadings (λ) were assessed to determine how well the specified factor reflected the item (relative to other items reflected by the same factor) where lower item loadings (e.g., $\lambda < .400$) tend to indicate the item may be a poor fit within the factor and/or overall model (Brown, 2015). The internal

validity of factors was assessed utilizing a combination of Cronbach's Alpha (α) and average variance extracted levels (AVE), where levels closer to one suggest stronger relations between items within selected factors and lower rates of unexplained error. To assess the discriminant validity of factors, the between-factor correlations were examined, where lower levels ($r < .700$) indicate the factors are explaining more unique variance than they are sharing with other factors in the model.

Measurement Model Testing

Prior to analyzing the study hypotheses, the measurement properties of the 16-item scale were examined through CFA. The initial model fit was relatively poor in comparison to past implementations of the selected measures [χ^2 (100) = 324.594, $p < .001$, CFI = .850, TLI = .820, RMSEA = .093 (90%, CI .082 to .104). Inspection of the factor loadings indicated two items were unacceptable relative to other items within their hypothesized factor: ["*My parents try to limit or control who my friends are*" (λ = .359; Excessive Control) and "*My parents try to protect me from negative influences*" (λ = .423; Excessive Problem Solving)]. As such, the measurement model parameters were further inspected utilizing the modification indices function in Lavaan to assess potential model misspecification. This analysis, in combination with prior implementations of the measures, did not suggest respecification of the problematic items to another factor would result in a theory-driven modification that would also improve model fit. As such the two poor performing items were removed from the measurement model. The modification indices also illustrated a high level of shared error variance between two items within the excessive support factor (see Table 2). Given the similarity in wording across these items, the error terms of these items were covaried and the CFA was rerun. The results of the final CFA indicated acceptable model fit: [χ^2 (72) = 157.764, $p < .001$, CFI = .936, TLI = .919, RMSEA = .067 (90%, CI .053 to .081).

As illustrated in Table 2, the measurement model exhibited acceptable levels of internal consistency (α) across the hypothesized overparenting (α = .908) and autonomy granting (α = .823) factors. Both the autonomy granting (AVE = .538) and overparenting (AVE = .772) factors also illustrated they were accounting for more variance than error (AVE > .500). In aggregate, the acceptable model fit and internal consistency suggested internal validity of the latent factors. The discriminant validity of the study measures was examined through between-factor correlations (see Table 3). Specifically, the correlation (r = .232, p = .015) between autonomy granting and overparenting did not exceed .700 indicating the factors were accounting for more unique variance than they shared, providing support for discriminant validity of the measures.

Results

Given the acceptable measurement properties evidenced by the CFA results, the hypotheses were tested utilizing SEM. Paralleling the model fit of the CFA, the SEM model fit also indicated acceptable model fit: [x^2 (144) = 214.000, $p < .001$, CFI = .961, TLI = .949, RMSEA = .043 (90%, CI .031 to .055). As illustrated in Table 4 and Figure 1, only a few of

Table 2. Descriptive and Confirmatory Statistics.

Factor/*Item*	M◊	SD	λ	α	AVE
Autonomy granting				.823	.538
My parents are receptive to things I say	5.54	1.34	.740		
My parents encourage me to express my individual views and opinions	5.88	1.30	.784		
My parents tolerate disagreements with me	4.83	1.47	.694		
My parents encourage independent thinking	6.09	1.18	.715		
Overparenting**				.908	.772
Excessive Control			.789		
Excessive Support			.943		
Excessive Problem Solving			.897		
Excessive control*				.675	.433
My parents make important decisions for me	4.78	1.54	.672		
My parents have told me that I need their support to succeed in life	3.55	1.87	.436		
My parents manage most important decisions in my life	4.14	1.72	.812		
Excessive support*				.729	.417
My parent intervenes in settling disputes with my classmates or friends#	3.33	1.84	.551		
My parents intervene in settling disputes with my teacher, coach, or youth program leaders #	4.26	1.85	.503		
When I'm engaged in an important task or project, my parents do some of it for me	3.12	1.80	.662		
My parents solve any crisis or problem I might have	3.67	1.82	.822		
Excessive problem solving*				.867	.686
If something doesn't work out for me, my parents do what they can to fix it	4.74	1.67	.794		
When something goes wrong in my life, my parents jump in to take care of it	4.47	1.66	.880		
My parents get actively involved in helping me solve the problems I experience	4.95	1.59	.810		

Note: ◊Means (M) are based upon complete case values; λ: standardized coefficient (factor loading); AVE: Average Variance Extracted; α: Cronbach's alpha.
**Overparenting is a 2nd order factor comprised of three 1st order factors, treated as items (indicated by *).
#indicates error terms of these items are covaried, due to evidence of high shared variance.

the hypothesized effects were supported in the present study. Specifically, as child age increased rates of reported overparenting decreased (H1A; $\beta = -.283$, $SE = .044$, $p < .001$); increased rates of child medical specialty camp experience also predicted lower rates of overparenting (H2A; $\beta = -.323$, $SE = .046$, $p = .001$). Similarly, as children reported greater levels of time since diagnosis, they reported decreasing rates of average daily self-checks of their CGM (H3C; $\beta = -.224$, $SE = .269$, $p = .006$) and lower rates of average daily parental checks of their CGM (H3D; $\beta = -.220$, $SE = .399$, $p = .022$). Likewise, as children reported greater rates of autonomy granting, they also reported higher rates of average daily CGM

Table 3. Evidence of Discriminant Validity: Correlations between Modelled Variables and Latent Factors.

	1	2	3	4	5	6	7	8
1. Age	—							
2. Camp experience	.534 (<.001)	—						
3. Years with T1D	.389 (<.001)	.659 (<.001)	—					
4. Years with CGM	.249 (<.001)	.477 (<.001)	.512 (<.001)	—				
5. Camper daily checks of CGM	−.025 (.775)	−.017 (.805)	−.143 (.043)	−.027 (.703)	—			
6. Parent daily checks of CGM	−.117 (.173)	−.109 (.094)	−.179 (.018)	−.001 (.998)	.616 (<.001)	—		
7. Autonomy granting	−.008 (.914)	−.030 (.678)	−.067 (.336)	.004 (.948)	.232 (.001)	.145 (.056)	—	
8. Overparenting**	−.440 (<.001)	−.446 (<.001)	−.287 (<.001)	−.184 (.011)	.058 (.479)	.174 (.032)	.232 (.015)	—

Note: <.001 indicates $p < .001$, all other exact p-values provided in parentheses below bivariate correlations; T1D = Type 1 Diabetes; CGM = Continuous Glucose Monitor.

**Overparenting is a 2nd order factor comprised of three 1st order factors.

Table 4. Strength and Significance of Hypothesized Effects.

Hypothesis	Predictor variable	Dependent variable	β	SE	*p*-value
H1A	Child age	Overparenting	−.283	0.044	<.001
H2A	Child camp experience	Overparenting	−.323	0.046	.001
H3A	T1D years	Overparenting	.021	0.027	.799
H4A	Child years with CGM	Overparenting	.030	0.045	.692
H1B	Child age	Autonomy granting	.102	0.048	.271
H2B	Child camp experience	Autonomy granting	.101	0.046	.332
H3B	T1D years	Autonomy granting	−.108	0.027	.246
H4B	Child years with CGM	Autonomy granting	.041	0.047	.635
H5A	Overparenting	Autonomy granting	.299	0.111	.016
H1C	Child age	CADCGM	−.013	0.596	.899
H2C	Child camp experience	CADCGM	.132	0.484	.174
H3C	T1D years	CADCGM	−.224	0.269	.006
H4C	Child years with CGM	CADCGM	.027	0.446	.716
H5B	Overparenting	CADCGM	.001	1.182	.998
H6A	Autonomy granting	CADCGM	.221	0.775	<.001
H1D	Child age	PADCGM	−.038	0.789	.725
H2D	Child camp experience	PADCGM	.055	0.691	.617
H3D	T1D years	PADCGM	−.220	0.399	.022
H4D	Child years with CGM	PADCGM	.116	0.592	.135
H5C	Overparenting	PADCGM	.116	1.317	.266
H6B	Autonomy granting	PADCGM	.104	1.119	.186

Note: Child Camp Experience = Total Years of Child Attending Study Site Camp; T1D Years = Child's Reported Years Diagnosed with Type 1 Diabetes; Child Years with CGM = Child's Reported Years using a Continuous Glucose Monitor; CADCGM = Child Average Daily Self-Checks of Continuous Glucose Monitor; PADCGM = Child Reported Average Daily Parental Check of Continuous Glucose Monitor; β = standardized regression coefficient; SE = Standard Error; <.001 indicates *p*-value is less than .001, all other exact *p*-values reported; Overparenting is a 2nd order factor comprised of three 1st order factors.

self-checks (H6A; β = .221, SE = .775, $p < .001$). Finally, increased rates of child reported overparenting were associated with increased rates of autonomy granting (H5A; β = .299, SE = .111, p = .016) in the opposite direction of the hypothesized effect.

Discussion

Developmentally inappropriate parenting can impede successful T1D management and monitoring (Erie et al., 2018; Hilliard et al., 2013; Landers et al., 2016). However, few studies have directly examined the relation between overparenting and T1D (Casillas et al., 2020; Harris et al., 2008; Gagnon et al., 2020). Correspondingly, the present study examined how repeated attendance of Medical Specialty Camps (MSCs) and individual characteristics (i.e., age, TSD, years with a CGM) may influence overparenting and autonomy granting, and CGM monitoring. The support for the study hypotheses were

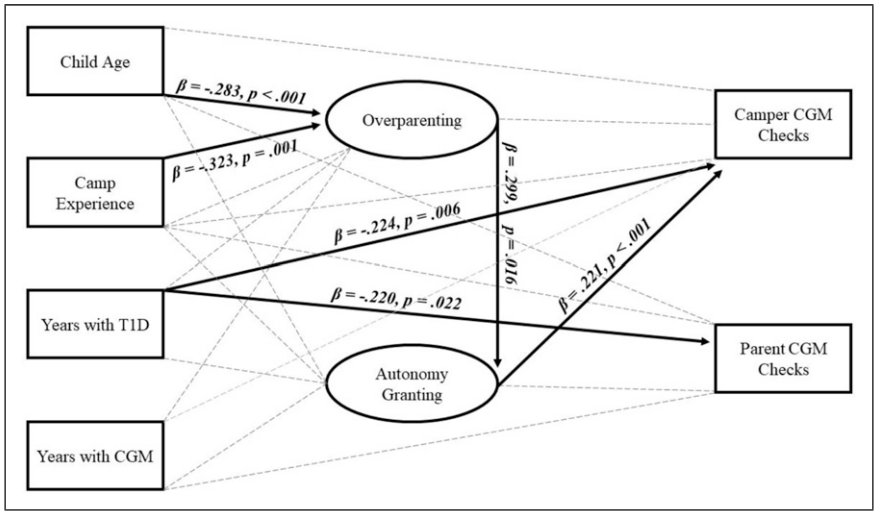

Figure 1. Structure Equation Model of Associations Between Child-Characteristics, Overparenting, Autonomy Granting, and Continuous Glucose Monitor Tracking. Note. β indicates standardized regression coefficient; exact *p*-value presented unless $p < .001$; Greyed Dashed Line represents non-significant ($p > .05$) parameters (see Table 4 for comprehensive presentation modelled parameters); overparenting is a second order factor reflecting three first order factors (not illustrated): excessive control, excessive support, and excessive problem-solving; covariances, error terms, and items excluded for illustrative purposes.

relatively mixed, but generally reflected the established relations between overparenting, child maturation, and T1D monitoring.

In support of the hypothesized effect (H1A, H2A), as child age and MSC experience increased, overparenting decreased. These finding suggests that as children mature and engage in more independent T1D experiences, parent involvement declines from excessive levels. These findings are consistent with Rote et al. (2020) and Kouros et al. (2017), who also illustrated a negative relation between child age and helicopter parenting. Gagnon et al. (2020) suggested that overparenting is more prevalent in parents of children with a special medical need. The current study's findings suggest (from the child perspective) such overparenting may become less obvious or impactful as they increase in age. Similarly, the negative relation between years of MSC experience and overparenting could be illustrative of the repeated benefits of these experiences. It is possible MSCs have cultivated child T1D skills and the ability for children to manage T1D independently that result in lower levels of developmentally excessive parental involvement. Given the evidence of positive associations between repeated MSC attendance and positive T1D outcomes (Barone et al., 2016) this may explain the negative effect in the present study. However, there were no predictive effects of years utilizing a CGM or years with T1D on overparenting (H3A, H4A). These non-significant effects could be partially explained by the similarity of effect across the four "year related" predictors, potentially reflecting a

higher order construct of maturation in T1D care for future research (Berg et al., 2017; Landers et al., 2016; Wiebe et al., 2014).

Martinek et al. (2016) and Gillet et al. (2012) suggested child age is negatively associated with autonomy support, where children will report lower perceptions and/or observations of autonomy supportive parenting practices. However, in the present study there was no significant influence of the hypothesized effects of child age, MSC camp experience, years with T1D, or years with a CGM on autonomy granting (H1B-H4B). These findings are partially consistent with Vrolijk et al. (2020) who found no relations between age and reported levels of parental autonomy support. Similarly, Soenens et al. (2007) demonstrated parental autonomy granting was invariant across adolescent age groups, suggesting parental autonomy granting behaviors should not be associated with child age. As self-determination theory suggests autonomy supportive behaviors inhibit maladaptive child behaviors (Vansteenkiste & Ryan, 2013), future research should examine what combination of maturation level characteristics may better predict parental autonomy granting behaviors.

A similar lack of support was indicated for the study hypotheses that child age (H1C), MSC camp experience (H2C), years with a CGM (H3C), overparenting (H5B), or autonomy granting (H6A) would influence rates of reported CGM self-checks and parental CGM checks (Berg et al., 2011; Landers et al., 2016). Given the evidence that positive T1D skills and management can increase with maturation and repeated MSC experiences (Barone et al., 2016), the lack of influence of these variables may demonstrate a need to further explore what combination of malleable maturation related factors predict enhanced T1D monitoring. However, as hypothesized, greater levels of time since T1D diagnosis were negatively associated with lower levels of CGM self-checks and parent-checks. While potentially counter intuitive, this relation between greater levels of experience with T1D and lower levels of adherence/frequency of T1D monitoring is supported T1D literature (Chase et al., 2010; Erie et al., 2018; Schilling et al., 2006). As children progress through their experiences with T1D, they also decline in T1D monitoring; which is correspondingly associated with negative health outcomes (Datye et al., 2021; Kelly & Berg, 2021). Factors that mitigate these declines in monitoring and management represent ongoing challenges within the context of T1D research.

Based on Gagnon and Garst (2019) and Cui et al. (2019), we hypothesized overparenting would have a negative effect on autonomy granting (H5A). However, the results more closely mirrored those of Jung et al. (2020) and Schiffrin et al. (2021) who found a positive relation between helicopter parenting and autonomy. In the present study as levels of overparenting increased so did rates of parental autonomy granting behaviors. This positive effect is somewhat reflective of the theorized positive relations between helicopter parenting, and controlling parental behaviors indicated by previous studies. For example, both Padilla-Walker and Nelson (2012) and Gagnon et al. (2020) found weak, but positive relations between overparenting and autonomy support. Such a relation was explained by Gagnon et al. (2020) as resulting from the protective nature of overparenting behaviors toward children having with a disability. The positive effect demonstrated in the present study could further illustrate the perceived "necessity" of engaging in overparenting behaviors for children who have a chronic illness and/or disability (Harris et al., 2008).

Inconsistent with the hypothesized relations, overparenting had no negative effect on CGM self-checks (H5B) and no positive effect on parental CGM checks (H5C). Specifically, these findings are contradictory to Gagnon and Garst (2019) who found (in a sample of parents of adolescents), that overparenting had a positive effect on both digital limit setting (e.g., monitoring of a child's social media and smart phones) and parental monitoring (e.g., my child has a firm curfew). The difference in effects between the present study and Gagnon and Garst (2019) may be due to sample differences. In the present study adolescents reported on their parents' behaviors, conversely in Gagnon and Garst (2019) the sample consisted of parents directly reporting on their own parenting behaviors. It also is possible the child-reported nature of the data accounted for this difference between the hypothesis and result, where parents may check the CGM more frequently than reported by the child (Messer et al., 2018).

Limitations, Future Directions, and Conclusion

While a few limitations and future directions were presented in the preceding section, some warrant additional detail. First, the sample was diverse relative to the preponderance of overparenting research (Gagnon et al., 2020), but may not fully reflect the multiple dimensions of diversity. For example, the cost of CGMs is significant, frequently not covered by insurance, and CGM usage is lower among non-white cohorts (Datye et al., 2021). Resultantly, the research underpinning CGM use may not reflect socioeconomic and racial diversity of persons who could benefit from CGM use. Indeed, the sampling strategy of the present study required CGM usage, so it is also possible that overparenting and autonomy granting may manifest differently in a sample of children not employing a CGM. Second, the data were self-reported and cross-sectional. The use of multiple reporters (i.e., parents and children) over several time periods may better explain the relations between the study variables, and potentially if/when parental monitoring of T1D manifests differently. Specifically, in the present study there was a negative effect of child time since diagnosis (TSD) on both youth and parental monitoring of CGM data. Put differently, it is possible that as a child grew in their level of experience managing their illness, they also monitored their CGM data less, but the cross-sectional nature of the present study data limits this potential conclusion.

A third limitation reflects the coarseness of some of the selected measures, where variables utilizing years as measures of time do not reflect the quality of these MSC experiences. Furthermore, research examining both quantity and quality of these experiences, time with T1D, and the level of adolescent maturation may illustrate a deeper influence on T1D related outcomes and monitoring (Gagnon et al., 2019). For instance, the child's level of "unplanned" hospital visits may be lower when parental monitoring is developmentally appropriate. A fourth limitation of the present study is the data did not fully capture the child's levels of T1D skills, socioemotional health, potential comorbidities, or critical incidents. While potentially complex, this information may better capture which subgroups benefit and/or deteriorate from overparenting and monitoring. For instance, behavior, social, and emotional challenges have been evidenced in the literature associated with adolescence and T1D. One maladaptive behavior that may

become more common as children with T1D mature through adolescence is diabulimia, an emerging eating disorder where the person with T1D deliberately reduces their insulin dose to lose weight (Coleman & Caswell, 2020). Given the relationship between gender and body image concerns in adolescents (Slater & Tiggemann, 2011), an examination of potential associations between T1D, overparenting, gender, and body esteem may yield results different than those illustrated in studies less focused on disability and/or illness. Specifically, both Gagnon and Garst (2019) and Kouros et al. (2017) found no gender differences in overparenting; however, their studies were not focused on populations with chronic illness.

Importantly, the study hypotheses, research questions, and empirical findings identified in previous studies of overparenting have most often employed primarily linear and/or correlational analyses (Cui et al., 2022; Gagnon & Garst, 2019; Padilla-Walker & Nelson, 2012; Segrin et al., 2012). Additionally, as noted in Gagnon et al. (2021), overparenting may manifest differently across contexts (e.g., athletics vs. academics) and may produce adaptive outcomes in some children and maladaptive outcomes in others. Thus, future investigation into the role of overparenting should consider non-linear techniques to determine if and/or where overparenting behaviors may be optimized for youth outcomes taking into consideration differences across settings.

Striking the balance between developmentally appropriate and inappropriate parenting is difficult in ideal circumstances. The addition of a serious illness can make this challenge insurmountable for some parents. The integration of technology like CGMs may inhibit the excessive behaviors reflected in overparenting, but also can represent a paradox, where the parent may over monitor their child due to the ease of access to CGM data. Thus, the parental balancing act of provisioning support, encouragement, and care without being excessive is especially important, as adolescents may deliberately disengage as they seek to establish their independence.

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Data Availiability Statement

As part of IARR's encouragement of open research practices, the author(s) have provided the following information. The deidentified data, Rscript, and coder used in the research can be obtained at: https://osf.io/np6e5/

ORCID iDs

Ryan J. Gagnon https://orcid.org/0000-0002-0338-6370
Barry A. Garst https://orcid.org/0000-0002-4706-3477
Leslie Heffington https://orcid.org/0000-0001-5457-2571

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