Self-compassion directly and indirectly predicts dietary adherence and quality of life among adults with celiac disease

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ABSTRACT

Strict adherence to a gluten-free diet (GFD) is the only treatment for preventing both short- and long-term consequences of celiac disease. Given that following a strict GFD can be difficult, evidence-based strategies are needed to improve the psychological experience of living with celiac disease and following the GFD. Self-compassion appears to be an important component of effectively self-regulating one's behavior to cope with a chronic disease. The main goal of this study was to examine the relationships between self-compassion and management of celiac disease as assessed by (a) adherence to a strict GFD and (b) celiac-specific quality of life (CQoL). The secondary goal of this study was to explore self-regulatory efficacy (i.e., confidence in one's ability to self-manage behavior to follow a strict GFD) and concurrent self-regulatory efficacy (i.e., one's confidence to self-manage other valued life goals *while* following a strict GFD) as mediators of the relationship between self-compassion and the primary outcomes (adherence and CQoL). In this prospective study, 200 North American adults diagnosed with celiac disease completed online questionnaires at two time points (baseline and 1 month later). Self-compassion at baseline *directly* predicted stricter adherence (at Time 2; $b = -0.63$, $p = 0.006$) and enhanced CQoL (at Time 2; $b = -0.50$, $p = 0.001$). Further, self-compassion (at Time 1) also *indirectly* predicted stricter Time 2 adherence through self-regulatory efficacy (at Time 1; $b = -0.26$, 95% CI [-0.58, -0.04], $R^2 = 0.29$) and enhanced Time 2 CQoL through concurrent self-regulatory efficacy (at Time 1; $b = -0.07$, 95% CI [-0.14, -0.03], $R^2 = 0.33$). This was the first study to assess the effects of self-compassion in relation to the psychological experience of coping with celiac disease and following a GFD. The findings indicate that self-compassion, self-regulatory efficacy and concurrent self-regulatory efficacy are important cognitions in understanding adherence to a GFD and CQoL among adults with celiac disease.

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Celiac disease is one of the most prevalent chronic gastrointestinal diseases in developed countries (Lionetti, Gatti, Pulvirenti, & Catassi, 2015). Individuals with celiac disease typically report a range of physical (i.e., gastro-intestinal upset, migraines, body pain) and/or psychological (e.g., depression, anxiety) symptoms (Green & Jabri, 2006; Guandalini & Assiri, 2014). Strict adherence to a gluten-free diet (GFD) is the only treatment for preventing both short- and long-term consequences from celiac disease (e.g., gastro-intestinal distress, intestinal cancers, osteoporosis, infertility; Green & Cellier, 2007) and is often associated with improvements in quality of life (Mustalahti et al., 2002; Nachman et al., 2009, Nachman et al., 2010; Roos, Karner, & Hallert, 2006). However, a recent review found that

quality of life does not always improve upon initiation of a GFD (Zingone et al., 2015). Indeed, many individuals with celiac disease report that the lack of alternative treatments to the GFD has a negative impact on their quality of life (Zingone et al., 2015) and/or continue to experience negative psychological symptoms such as anxiety and depression (Casellas et al., 2015). Further, following a GFD can be difficult. Findings from a review of the literature suggest that there is variation in the rates of strict adherence to a GFD and that a large proportion of individuals with celiac disease appear to struggle to achieve and maintain strict adherence (Hall, Rubin, & Charnock, 2009).

Recently, Sainsbury, Mullan, and Sharpe (2013a) found that adaptive coping strategies were associated with positive attitudes, perceptions of control and intentions to adhere to a GFD among adults with celiac disease. Based on their findings, Sainsbury et al. (2013a) called for the development of evidence-based strategies to improve coping with celiac disease. While previous research has

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identified a range of positive outcomes associated with strict adherence to a GFD (e.g., Green & Jabri, 2006; Nachman et al., 2010; Roos et al., 2006), evidence-based strategies are needed to improve adherence to a strict GFD and the psychological experience of coping with celiac disease. One such programme that included strategies to target coping and self-efficacy among others, and which demonstrated positive effects on adherence, has been published to date (Sainsbury, Mullan, & Sharpe, 2013b). Drawing from health psychology literature, self-regulation and self-compassion have been identified as important components of adherence to a medical regimen and coping with chronic diseases (e.g., youth coping with asthma; Clark, Gong, & Kaciroti, 2014; Terry & Leary, 2011).

Self-regulation is the process through which individuals self-manage their behavior (Bandura, 2005). This process of self-regulation involves four main components, self-monitoring, goal-setting, planning and reflecting. Research shows that people can be taught how to self-regulate (Baumeister, Gailliot, DeWall, & Oaten, 2006), and that one's confidence to self-manage their behaviors to achieve a desired outcome (i.e., self-regulatory efficacy) is an important determinant of health behaviors (e.g., physical activity during arthritis flares; Gyurcsik, Brawley, Spink, & Sessford, 2013). In regard to celiac disease, higher self-regulatory efficacy directly predicts fewer instances of accidental gluten consumption and indirectly predicts fewer instances of purposeful gluten consumption through intentions (Dowd, Chen, Jung, & Beauchamp, 2015). Based on Dowd et al. (2015) finding, self-regulatory efficacy appears to be an important cognition involved in adherence to a GFD among adults with celiac disease. In addition to self-regulatory efficacy to follow a strict GFD, one's confidence to self-manage other valued life goals *while* following a strict GFD could influence one's ability to self-manage a chronic disease (i.e., concurrent self-regulatory efficacy; Jung & Brawley, 2013). Indeed, if one does not feel confident to follow a strict GFD *at the same time* as managing other valued life goals (e.g., work or family commitments), the person is unlikely to be able to strictly adhere to a GFD (Jung & Brawley, 2011). As such, further inquiry regarding factors that facilitate effective self-regulation among people coping with celiac disease and managing other valued life goals is warranted.

It has been suggested that self-compassion may be directly related to self-regulatory cognitions (Terry & Leary, 2011). Self-compassion is simply giving oneself the same kindness and caring that one typically gives to other people; it is a positive way of relating to oneself that involves self-kindness, mindfulness, and a sense of common humanity (feeling socially connected to other people; Neff, 2003). Specifically, Terry and Leary (2011) theorized that people who are more self-compassionate are more likely to be able to effectively self-regulate because they are less judgmental when they self-monitor, set more realistic, growth oriented goals and reflect on progress in a kinder, caring manner. People who are higher in self-compassion report greater quality of life (Van Dam, Sheppard, Forsyth, & Earleywine, 2010), life satisfaction (Neff, 2003) and well-being (Neely, Schallert, Mohhammed, Roberts, & Chen, 2009). In addition, self-compassion is associated with more adaptive coping strategies (Neff, Hsieh, & Dejitterat, 2005) and more personal initiative and responsibility in the general population (Leary, Tate, Adams, Allen, & Hancock, 2007; Neff, Rude, & Kirkpatrick, 2006) and in chronic disease populations (Sirois, Molnar, & Hirsch, 2015). Sirois, et al. (2015) found that higher levels of self-compassion were associated with better coping strategies and outcomes among adults coping with inflammatory bowel disease or arthritis. Given the similarities in coping with inflammatory bowel disease and celiac disease (i.e., strict diet with the patients often dealing with a variety of digestive struggles), self-compassion holds high potential for promoting positive coping for individuals with celiac disease. The effects of self-compassion on people managing celiac disease have yet to be explored.

It is important to acknowledge the numerous demands on someone coping with a chronic disease such as celiac disease. In addition to being extremely diligent about what food they eat at all times which often involves extra cooking time and shopping and specialty store, individuals with celiac disease often have multiple additional demands on their time such as doctors appointments to manage other associated concurrent conditions (e.g., Hashimotos hypothyroidism, osteoporosis, infertility; Canova et al., 2016; Tersigni et al., 2014). If a person can practice self-compassion to help them cope with these multiple demands on their daily life, it is likely to reduce negative thoughts, increase positive thoughts and health self-efficacy (Sirois, 2015; Sirois, Kitner, & Hirsch, 2015; Sirois et al., 2015), thereby reducing total cognitive load. As such, people with celiac disease who practice self-compassion are more likely to have more cognitive resources left to effectively self-regulate (i.e., better adherence to a GFD), and manage multiple valued life goals (e.g., increase CQoL because multiple areas of life are attended to). Given that these outcomes are all implicated in adaptive coping with celiac disease, self-compassion is likely to be associated with effective self-management of celiac disease. With this in mind, the overall purpose of this study was to examine self-compassion in relation to celiac specific quality of life (CQoL) and adherence to a GFD among adults with celiac disease.

1. The current study

The main aim of this study was to examine the relationships between self-compassion and the primary outcomes, (a) adherence to a strict GFD and (b) CQoL. The secondary aim of this study was to explore the indirect relationships between self-compassion and the primary outcomes, through self-regulatory efficacy and concurrent self-regulatory efficacy. It was hypothesized that higher self-compassion would directly predict stricter adherence to a GFD and higher CQoL. Furthermore, based on Terry and Leary (2011), it was hypothesized that self-regulatory efficacy and concurrent self-regulatory efficacy would mediate the relationships between self-compassion and the primary outcomes (adherence and CQoL).

2. Methods

2.1. Participants and design

Institutional ethical approval was obtained from our institutional behavioral research ethics board before data were collected. Participants were recruited through postings on celiac and gluten-free social media online portals, associations for people with celiac disease as well as emails to members of the Canadian Celiac Association and the National Foundation for Celiac Awareness. Individuals interested in participating in the study were asked to contact the first author and were subsequently sent an information letter, asked to consent to participate online and then completed an online questionnaire (Time 1). One month later participants were contacted again to complete a follow-up questionnaire (Time 2). Two-hundred and twenty North American adults (M_{age} = 44.02 yrs; 91% female) with blood test and/or biopsy confirmed diagnosis of celiac disease completed the baseline questionnaire and 200 completed the same questionnaire at 1-month follow-up between September 2014–June 2015. Individuals were eligible to participate in this study if they had been diagnosed with celiac disease ($M_{years\ since\ diagnosis}$ = 7.85, SD = 7.85), were at least 18 years of age, had regular access to and were competent with computers and the Internet, and were fluent in English. Participants were entered in a draw to win one of four $50 Visa gift cards.

2.2. Measures

2.2.1. Demographics

Participants were asked to report basic information on demographics including age, sex, means of diagnosis (blood test and/or biopsy) and time since diagnosis.

2.2.2. Celiac dietary adherence test

Adherence to a GFD was measured using the 7-item measure developed by Leffler et al. (2009). This measure assesses four different aspects of adherence to a GFD (i.e., celiac symptoms, self-efficacy, reasons to follow a GFD, perceived adherence to a GFD) with four different scales. An exemplar item is "I am able to follow a GFD when dining outside my home" assessed on a 1 (*strongly agree*) to 5 (*strongly disagree*) scale. Responses to items are summed for a total score where lower scores indicate stricter adherence to a GFD. Leffler et al. (2009) provide evidence of face validity and test-retest reliability (Pearson $r = 0.82$). In the present study, scores derived from this instrument displayed acceptable levels of test-retest reliability after 1 month (Pearson $r = 0.61$).

2.2.3. Purposeful and accidental consumption of gluten

Participants were asked to report their adherence to a gluten-free diet over the past week based on (a) number of incidents of *accidental* gluten ingestion and (b) number of incidents of *purposeful* gluten ingestion. Data collected using these items have demonstrated evidence of face validity and test-retest reliability (Pearson $r_{accident} = 0.39$, $p < 0.01$; Pearson $r_{purpose} = 0.70$, $p < 0.01$; Dowd et al., 2015). Test-retest reliability was acceptable based on scored derived from this instrument in the current study (Pearson $r_{accident} = 0.36$, $p < 0.01$; Pearson $r_{purpose} = 0.75$, $p < 0.01$).

2.2.4. Self-compassion

Self-compassion was assessed using a 26-item measure developed by Neff (2003). Participants were asked to respond to items regarding their self-compassion on a 1 (*almost never*) to 5 (*almost always*) scale. An exemplar item is "I'm disapproving and judgmental about my own flaws and inadequacies". Responses to negatively worded items are reverse scored and then the mean score across all 26-items is calculated with higher scores indicating higher self-compassion. Data derived from this measure have demonstrated acceptable reliability and validity in assessing self-compassion community and student samples (Cronbach $\alpha = 0.93$; Neff & Pommier, 2013) and adults with inflammatory bowel disease (Cronbach $\alpha = 0.94$; Sirois et al., 2015). In the present study, scores derived from this instrument displayed acceptable levels of internal consistency (Cronbach $\alpha = 0.95$).

2.2.5. Self-regulatory efficacy

Participants' confidence to self-regulate their behavior to consume a GFD was assessed using a revised 6-item measure developed by Strachan and Brawley (2008). Participants were asked to respond to items regarding their self-regulatory abilities for following a strict GFD on a standard 0 percent (*not at all confident*) to 100 percent (*completely confident*) self-efficacy scale (McAuley & Mihalko, 1998). An exemplar item is "How confident are you that you can motivate yourself to eat a strict GFD over the next month?". The mean score across all 6-items is calculated with higher scores indicating higher self-regulatory efficacy. Data derived from this instrument have demonstrated acceptable reliability in assessing self-regulatory efficacy for eating a GFD among adults with celiac disease (Cronbach $\alpha = 0.87$; Dowd et al., 2015). In the present study, scores derived from this instrument displayed acceptable levels of internal consistency (Cronbach $\alpha = 0.95$).

2.2.6. Concurrent self-regulatory efficacy

Participants' confidence to refrain from eating gluten whilst managing other valued life goals was assessed using a revised 4-item measure developed by Jung and Brawley (Jung & Brawley, 2013). The original measure was designed to assess concurrent self-regulatory efficacy to exercise on a regular basis while also managing other important life goals. Participants in this study were asked to respond to items regarding their concurrent self-regulatory abilities for following a strict GFD while managing other important life goals on a standard scale from 0 (*not at all confident*) to 100 (*completely confident*). An exemplar item is "During the *next month*, how confident are you in your ability to concurrently manage both your GFD and your other important life goals?". The mean score across all 4-items is calculated with higher scores indicating higher concurrent self-regulatory efficacy. Data derived from this instrument have demonstrated acceptable reliability in assessing concurrent self-regulatory efficacy among working mothers (Jung & Brawley, 2011). In the present study, scores derived from this instrument displayed acceptable levels of internal consistency (Cronbach $\alpha = 0.88$).

2.2.7. Celiac quality of life (CQoL)

Participants' overall life satisfaction while living with celiac disease was assessed by a 20-item celiac disease specific CQoL questionnaire on a scale from 1 (*not at all*) to 5 (*a great deal*) (Dorn et al., 2010). An exemplar item is "I find it difficult to travel or take long trips because of my Celiac disease". The mean score across all 20-items is calculated where lower scores indicate better CQoL. Data derived from this measure have demonstrated acceptable convergent validity with psychological distress and abdominal pain (r^2 range = 0.35−0.65) and divergent validity from the irritable bowel syndrome QoL questionnaire ((r = 0.62); Dorn et al., 2010). In the present study, scores derived from this instrument displayed acceptable levels of internal consistency (Cronbach $\alpha = 0.92$).

2.3. Data analysis

Direct effects of self-compassion on the primary outcomes (adherence and CQoL) and mediational effects of self-regulatory efficacy and concurrent self-regulatory efficacy on the relationships between self-compassion and were tested using Hayes's (www.afhayes.com) PROCESS tool in SPSS (Version 22.0). PROCESS uses path analysis to estimate direct and indirect effects in mediation models. Bootstrapping was used to generate confidence intervals around the indirect (mediation) effects. In the current study a bootstrap sample of 1000 was used. Preacher and Hayes (2008) recommend using this procedure over the causal steps approach because bootstrapping does not carry the assumption of normally distributed variables. In using the bootstrapping procedure, 95% bias corrected and accelerated confidence intervals (BCaCI) are produced. The variable(s) mediate the relationship if the BCaCI does not contain zero (Preacher & Hayes, 2008). Only data from participants who completed the questionnaire at both time points were included in the analyses.

For the prediction of adherence to a GFD, our a priori hypothesized model included self-compassion at Time 1 as the independent variable, adherence to a GFD at Time 2 as the dependent variable and self-regulatory efficacy and concurrent self-regulatory efficacy at Time 1 as the hypothesized mediators. For the prediction of CQoL, our a priori hypothesized model included self-compassion at Time 1 as the independent variable, CQoL at Time 2 as the dependent variable and self-regulatory efficacy and concurrent self-regulatory efficacy at Time 1 as the hypothesized mediators.

Effect sizes were calculated using κ^2 in SPSS (Preacher & Kelley, 2011). Preacher and Kelley (2011) suggest the following guidelines

for interpretation of κ^2 effect sizes – a small effect is 0.01, a medium effect is approximately 0.09 and a large effect is around 0.25.

2.4. Power calculation

Based on recommendations provided by Cohen (1992), the following parameters were used to estimate the necessary sample size $\alpha = 0.05$, $\beta = 0.80$, 30% dropout and a small effect size for the relationship between self-compassion and behavior (Sirois, Kitner, et al., 2015), we aimed to collect data from 200 participants.

3. Results

Descriptive statistics for study demographic variables are reported in Table 1 and outcome variables are reported in Table 2. Approximately 7% of participants at Time 1 reported consuming gluten on purpose over the past week and 19% reported consuming gluten by accident over the past week. Overall, participants at Time 1 reported excellent or very good adherence to the GFD based on responses to the CDAT ($M = 11.78$; $SD = 3.22$). CDAT scores were significantly negatively correlated with main study variables: self-regulatory efficacy, concurrent self-regulatory efficacy, and CQoL, indicating better adherence (lower CDAT scores) was associated with higher self-efficacy and CQoL (see Table 2). Twenty individuals dropped out after completing baseline questionnaires. Participants who dropped out were more likely to be younger ($M_{\text{age dropouts}} = 38.89$ years old, $M_{\text{age participants}} = 44.51$ years old; $t = 2.45$, $p = 0.02$) and consume gluten on purpose (21% of dropouts consumed on purpose whereas 6% of study participants consumed gluten on purpose, $\chi^2 = 5.86$, $p = 0.04$) than study participants. Dropouts and study participants did not differ in years since diagnosis ($t = 1.34$, $p = 0.16$), accidental gluten consumption ($\chi^2 = 0.052$, $p = 0.51$), self-compassion ($t = -0.30$, $p = 0.76$), self-regulatory efficacy ($t = 1.06$, $p = 0.29$), concurrent self-regulatory efficacy ($t = 0.27$, $p = 0.79$) or adherence based on CDAT scores ($t = -0.01$, $p = 0.99$).

3.1. Direct effects on adherence and CQoL

With regard to direct effects on adherence to a GFD, consistent with our hypothesis, both self-compassion and self-regulatory efficacy at Time 1 directly predicted adherence to a GFD at Time 2 (see Fig. 1). Contrary to our hypothesis, concurrent self-regulatory efficacy at Time 1 did not predict adherence to a GFD at Time 2 (see Fig. 1). As hypothesized, self-compassion directly predicted CQoL (see Fig. 2). Self-regulatory efficacy and concurrent self-regulatory efficacy did not reach standard levels of significance in prediction of CQoL ($bs = -0.01$, $ps = 0.06$; see Fig. 2).

3.2. Mediation analysis

In terms of indirect effects of the proposed mediator variables

on adherence to a GFD, as shown in Fig. 1, there was evidence of a significant indirect effect. Specifically, as hypothesized, self-regulatory efficacy partially mediated the relationship between self-compassion and adherence to a GFD. However, contrary to our hypothesis, concurrent self-regulatory efficacy did not have a significant indirect effect on the relationship between self-compassion and adherence to a GFD. As such, concurrent self-regulatory efficacy was removed from the final model for the direct and indirect effects of self-compassion on adherence (see Fig. 3). Together with self-compassion, self-regulatory efficacy predicted 28.5% of the variance in adherence behavior. This represents a small to medium effect, $\kappa^2 = 0.058$, 95% BCa CI [0.012, 0.124].

With regards to the indirect effects of the proposed mediator variables on CQoL, as shown in Fig. 2, there was evidence of a significant indirect effect. Specifically, consistent with our hypothesis, concurrent self-regulatory efficacy partially mediated the relationship between self-compassion and CQoL. Contrary to our hypothesis, self-regulatory efficacy did not have a significant indirect effect on the relationship between self-compassion and CQoL. As such, self-regulatory efficacy was removed from the final model for the direct and indirect effects of self-compassion on adherence (see Fig. 4). Combined with self-compassion, concurrent self-regulatory efficacy predicted 33.0% of the variance in CQoL. This represents a small to medium effect, $\kappa^2 = 0.065$, 95% BCa CI [0.022, 0.130].

4. Discussion

This was the first study to assess the effects of self-compassion in relation to celiac specific quality of life and following a strict GFD. In line with previous research in other populations, self-compassion directly predicted CQoL (Neff & Germer, 2013; Van Dam, Sheppard, Forsyth, & Earleywine, 2011) and adherence behavior (Sirois et al., 2015; Sirois et al., 2015) and support was found for the hypothesized mediators (self-regulatory efficacy and concurrent self-regulatory efficacy). Furthermore, consistent with research that self-regulatory efficacy predicts dietary behavior (Kreausukon, Gellert, Lippke, & Schwarzer, 2012; Scholz, Nagy, Gohner, Luszczynska, & Kliegel, 2009) and specifically among people with celiac disease, self-regulatory efficacy directly predicted adherence to a GFD (Dowd et al., 2015). Given the high emotional and social burden of following a GFD (Zarkadas et al., 2013), these findings provide insight into psychological strategies that could be used to improve effective management of celiac disease. Specifically, based on these findings, teaching people with celiac disease strategies to be more self-compassionate may directly increase CQoL. Further, fostering confidence to self-regulate behavior to follow a GFD appears to be key to effectively supporting people with celiac disease to follow the only treatment for the chronic disease, a strict GFD. Based on the findings from the current study, research is warranted to explore the effects of bolstering self-compassion and self-regulation skills among people with celiac disease as these skills likely have positive effects on CQoL and adherence to a GFD.

In addition to self-compassion directly predicting CQoL, another novel finding from the current study is that self-compassion also directly predicted adherence to a GFD. Dunne, Sheffield, and Chilcot (2016) recently explored the role of self-compassion in facilitating better health and found that health promoting behaviors (such as healthy dietary practices) partially mediated the relationship between self-compassion and physical symptoms. However, this is the first study to show that self-compassion is a determinant of adherence to the only treatment for celiac disease, a GFD. Preliminary evidence from the behavior change literature suggests that self-compassion-based interventions are associated with improvements in well-being and mindfulness (Neff & Germer, 2013).

Table 1
Descriptive statistics – participant demographics at time 1.

Variable	Participants n = 220
Sex	202 women (91.4%)
	17 men (7.7%)
	1 prefer not to answer (0.5%)
Age	$M = 44.01$ ($SD = 13.33$)
Years since diagnosis	$M = 7.85$ ($SD = 7.85$)
Symptomatic	207 (94.0%)
	13 (6.0%)

Table 2
Descriptive statistics and zero-order correlations for adherence behavior among adults with celiac disease.

Variable	N	M	SD	Skewness	Kurtosis	2	3	4	5	6	7	8	9
1. SC (T1)	194	3.34	0.75	−0.14	−0.41	0.16*	0.36**	−0.32**	0.87**	0.09	0.15*	−0.25**	−0.53**
2. SRE (T1)	193	95.30	8.85	−3.83	18.33		0.55**	−0.53**	0.09	0.88**	0.54**	−0.50**	−0.26**
3. CSRE (T1)	192	88.29	15.86	−2.38	7.26			−0.44**	0.28**	0.46**	0.59**	−0.34**	−0.36**
4. CDAT (T1)	194	11.78	3.22	1.37	2.88				−0.31**	−0.43**	−0.35**	0.63**	0.43**
5. SC (T2)	184	3.38	0.76	0.01	−0.66					0.11	0.18*	−0.30**	−0.51**
6. SRE (T2)	184	95.90	8.94	−5.34	34.94						0.63**	−0.51**	−0.23**
7. CSRE	183	90.83	11.84	−2.34	7.90							−0.43**	−0.28**
8. CDAT (T2)	187	11.18	2.68	1.11	2.50								0.46**
9. CQoL (T2)	184	2.54	0.80	0.42	−0.65								

Note. SC = self-compassion; SRE = self-regulatory efficacy; CSRE = concurrent self-regulatory efficacy; CDAT = Celiac Dietary Adherence Test; CQoL = celiac quality of life. T1 = Time 1; T2 = Time 2. CQoL was only measured at Time 2. Correlations significant at *$p < 0.05$, **$p < 0.01$. Self-compassion measured from 1 (*almost never*) to 5 (*almost always*), self-regulatory efficacy measured from 0% (*not at all confident*) −100% (*completely confident*), concurrent self-regulatory efficacy measured from 0% (*not at all confident*) −100% (*completely confident*), adherence measured from 1 (*none of the time/strongly agree/very important*) to 5 (*all of the time/strongly disagree/not at all important*), CQoL measured from 1 (*not at all*) to 5 (*a great deal*). Higher scores for self-compassion, self-regulatory efficacy and concurrent self-regulatory efficacy indicate higher self-compassion and confidence to self-regulate behaviors. Lower scores for adherence and CQoL indicate better adherence to a GFD and better quality of life.
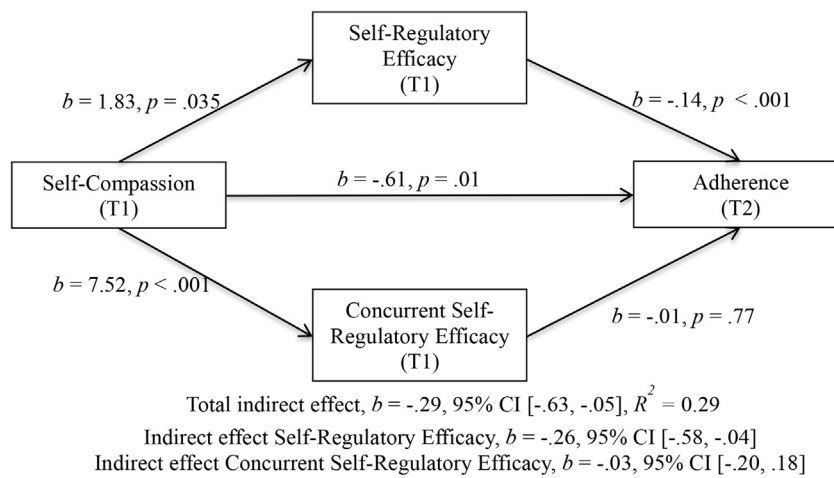

Fig. 1. Path diagram of self-regulatory efficacy and concurrent self-regulatory efficacy as mediators between self-compassion and adherence to a GFD.
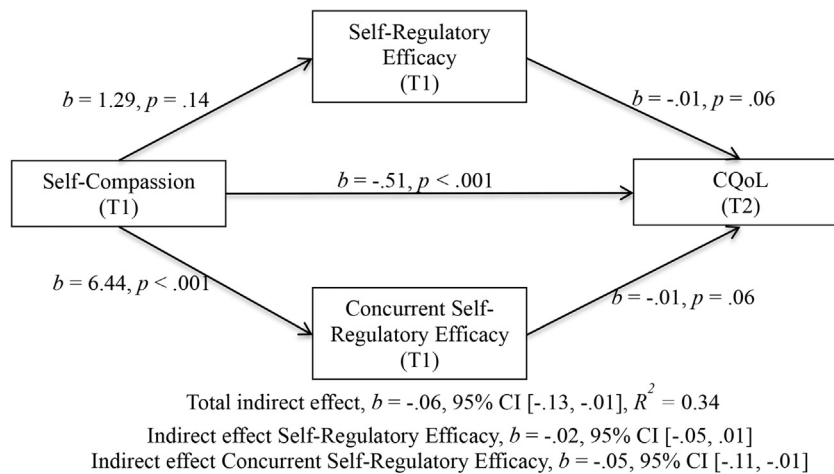

Fig. 2. Path diagram of self-regulatory efficacy and concurrent self-regulatory efficacy as mediators between self-compassion and CQoL.

A recent mindfulness (a component of self-compassion) based intervention was associated with improved CQoL, reduced stress and reduced symptom severity among adults with irritable bowel syndrome (Gaylord et al., 2011). Similarly, another mindfulness-based intervention was associated with improved health status and lower depression among adults with type 2 diabetes (Hartmann et al., 2012). Findings from the current study build on and extend previous work and highlight the potential fruitfulness of teaching people self-compassion skills to enhance their ability to cope with chronic disease.

From a behavior change perspective, it is beneficial to elucidate mechanisms that affect changes in cognitions and behaviors. In
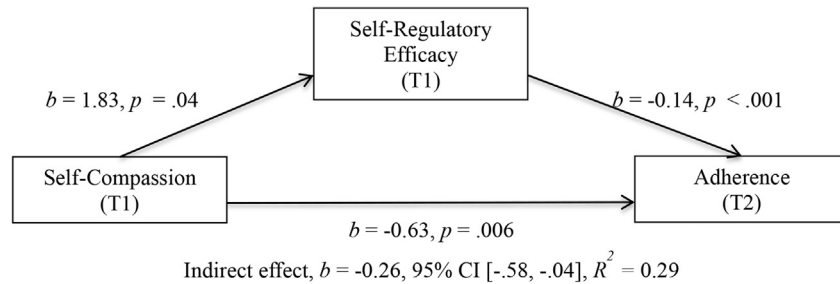
Fig. 3. Final model of the direct and indirect effects of self-compassion on adherence to a GFD.
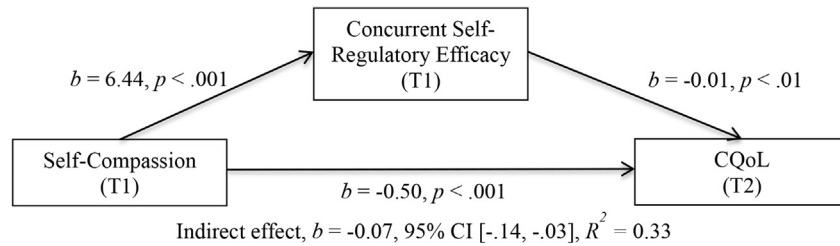

Fig. 4. Final model of the direct and indirect effects of self-compassion on CQoL.

addition to the direct effects of self-compassion on CQoL and adherence to a GFD, the findings from the current study reveal mechanisms through which self-compassion appears to indirectly affect these key outcomes for people with celiac disease. Specifically, analyses revealed that self-compassion indirectly predicted adherence to a GFD through self-regulatory efficacy. These findings are not surprising given the plethora of literature supporting the importance of self-regulatory efficacy in successful dietary behavior change (Kreausukon et al., 2012; Scholz et al., 2009). Indeed, Dowd et al. (2015) also found that self-regulatory efficacy directly predicted fewer instances of accidental gluten consumption. These findings are logical, as someone who is confident in their abilities to engage in self-regulatory behaviors such as planning ahead, overcoming barriers (e.g., social situations) and asking direct questions about food prior to consumption will be more likely to follow a strict GFD. Furthermore, given that consuming gluten by accident (vs. on purpose) is the most common way people with celiac disease fail to adhere to a GFD (Hall, Rubin, & Charnock, 2013), bolstering self-regulatory efficacy is clearly a key cognition involved in helping people to effectively manage celiac disease.

Interestingly, entering self-regulatory efficacy and concurrent self-regulatory efficacy simultaneously in the model did not result in better prediction of adherence or CQoL. Specifically, looking at these relationships separately in our *a priori* planned analyses revealed that self-regulatory efficacy did not mediate the relationship between self-compassion and CQoL and concurrent self-regulatory efficacy did not mediate the relationship between self-compassion and adherence. It is possible that self-regulatory efficacy is a mediator of adherence behavior because this construct specifically pertains to one's confidence in one's abilities to self manage behavior to adhere to a GFD. Concurrent self-regulatory efficacy may be more important in determining CQoL while coping with celiac disease because this construct refers to one's abilities to concurrently manage multiple valued life goals. If one is not confident to follow a strict GFD while *also* managing other important aspects of their life (e.g., family duties, social relationships, physical activity), it is logical to assume that overall CQoL would be lower due to an inability to concurrently manage multiple valued aspects of one's life.

This study is not without limitations. First, participants were recruited through online celiac support groups, which may inherently lead to recruitment of participants who are more motivated to effectively cope with celiac disease. Given the relatively low levels of non-adherence behavior reported in the current study (i.e., mean CDAT scores lower than 13 which is indicative of excellent or very good adherence; Leffler et al., 2009; 7% consumed gluten on purpose and 19% consumed gluten by accident), it is likely that the current findings may not pertain to individuals who demonstrate poorer adherence to a GFD. Future work should aim to recruit people who are specifically struggling with celiac disease and following a GFD. The second limitation of this study is the reliance on self-reported adherence (the CDAT and intentional and accidental consumption of gluten); it would be beneficial for future work to include adherence as assessed by a dietician. In addition, the third limitation of this study is the finding that participants who dropped out were more likely to consume gluten intentionally is important to take into consideration in the context of the study findings. Specifically, intentional consumption of gluten may involve different cognitions regarding coping with celiac disease. Further research is warranted to assess the relationship between people who are likely to consume gluten on purpose and use of self-compassion skills. Relatedly, interpretation of the findings from this study should also consider that the majority of participants had been diagnosed with celiac disease for at least 7.85 years. It is likely that the cognitions that affect outcomes among those who are newly diagnosed with celiac disease are different from those that affect individuals who have been managing celiac disease for a longer period of time. It would be beneficial to specifically examine the relationship between self-compassion, adherence and CQoL among individuals who were recently diagnosed.

Nonetheless, the findings of the current study are noteworthy for several reasons. First, the prospective design of study enabled prediction of key celiac disease related outcomes (CQoL, adherence) 1 month after assessment of the cognitions. Given that self-compassion directly and indirectly predicted CQoL and adherence prospectively, this gives us confidence that this relationship may persist over time. Secondly, given the online nature of the study, we were able to draw from a large North American-based population,

which increases the generalizability of the findings. In conclusion, the main implications from this work are that self-compassion appears to have significant direct and indirect effects on important outcomes among people living with celiac disease. Confidence in one's ability to effectively self-regulate to (a) follow a strict GFD or (b) concurrently manage multiple valued life goals also plays an important role in determining coping with celiac disease as indicated through CQoL and adherence to a GFD. Overall it appears that when people feel more self-compassionate they are able to self-regulate their behaviors better. Thus, future research is warranted to examine the effectiveness of teaching self-compassion and concurrent self-regulatory management skills to help people to effectively manage celiac disease.

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