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ADOLESCENTS' SUBJECTIVE WELL-BEING FOLLOWING KNEE INJURY: A LONGITUDINAL STUDY ON PERCEIVED AUTONOMY SUPPORT

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Abstract. During adolescence, knee injuries are common and can greatly affect patients' subjective well-being. Social support has been identified as a buffer against ill-being after knee injury. Self-determination theory holds that optimal social support nurtures the psychological need for autonomy, which is defined as a sense of personal endorsement of one's actions. This longitudinal study aimed to examine the contributions of perceived parent and physician autonomy support to the subjective well-being of knee-injured adolescents. A total of 44 adolescent patients (M_{age} = 14.7 years) from a paediatric sports medicine clinic participated. In the waiting room (T0), data on perceived parental autonomy support, subjective well-being, athletic identity, and knee function were collected. After their appointment (T1), participants rated their perception of physician autonomy support. Participants later reported their subjective well-being monthly, for 3 months (T2–T4). Descriptive analyses revealed that perceived parental autonomy support was positively and often strongly correlated with subsequent subjective well-being. The positive association remained significant solely at T3 in regressions controlling for physician autonomy support, baseline subjective well-being, and other key confounders. Perceived physician autonomy support was positively but non-significantly correlated with later subjective well-being. These results suggest that perceived autonomy support, particularly from parents, may help overcome the deleterious effects of knee injury on adolescents' subjective well-being.

Keywords: subjective well-being, autonomy support, adolescents, knee injuries, parents, physician

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In adolescence, the knee joint emerges as a site of frequent injuries (Fuglkjær et al., 2017; Kraus et al., 2012), owing to its intricate structure being vulnerable to the multidirectional forces that occur during high-impact activities (Gage et al., 2012; Louw et al., 2008). Estimates of the global prevalence of knee injuries in adolescents range from 10% to 25%, though recent research suggests that the rate may be increasing (Louw et al., 2008). Among the paediatric population, the incidence of knee injury has been found to increase with age (Fuglkjær et al., 2017; Kraus et al., 2012).

Such injuries can have deleterious effects — for example, residual functional deficits (Whittaker et al., 2015) and early-onset osteoarthritis (Whittaker et al., 2018) — on adolescents' physical wellness, and also on their psychological well-being. Indeed, many studies of athletes in the sports psychology literature have shown that knee injuries negatively impact adolescents' well-being, with research reporting outcomes such as elevated mood disturbances (Udry et al., 2003), increased depressive symptoms (Manuel et al., 2002), poorer psychological health (Boykin et al., 2013), and lower scores on the mental health component of health-related quality of life (McGuine et al., 2012; McGuine et al., 2014). Furthermore, the emotional impact appears to be greater in youth who have suffered greater functional impairment of the knee (Boykin et al., 2013; McGuine et al., 2012) and who more strongly identify with the role of athlete (Manuel et al., 2002; Masten et al., 2014).

Subjective Well-Being

Although the conceptualization of quality of life, which encompasses both objective and subjective indicators, has gained popularity in clinical research, its definition and measurement vary from study to study. There is little consensus on the exact nature of this construct (Karimi & Brazier, 2016), despite previous efforts to conceptualize it (see Saxena et al., 1997; Whoqol Group, 1995). Furthermore, researchers have raised many issues related to the operationalization of the quality-of-life construct. Some have argued that most tools for measuring quality of life predominantly rely on objective indicators, whereas its subjective component may be more appropriate for capturing a person's unique experience (e.g., Grunert et al., 2007; Moons et al., 2006). One such example that has received increased attention over the past decades is the concept of subjective well-being (SWB; Diener, 1984; Ryan & Deci, 2001), which will be the focus of the present study.

SWB is derived from affective and cognitive assessments of individuals. It is typically conceived as comprising more pleasant and fewer unpleasant emotions (called positive and negative affect; Diener et al., 2010; Watson et al., 1988) as well as greater satisfaction with one's life (Diener, 1984). Its subjective nature means that it resides within each individual's conceptualization and "relies on the standards of the respondent to determine what is the good life" (Diener, 1984, p. 543). Although objective conditions (e.g., health, comfort, and wealth) can influence SWB, they are not inherent and necessary components (Diener, 1984, 2000, 2012).

Autonomy Support

Empirical evidence suggests that social support acts as a buffer against psychological maladjustment after knee injury, with sources of social support including family members and health care providers (see Truong et al., 2020, for a scoping review). Yet researchers have struggled to determine what constitutes optimal social support — the core elements that distinguish supportive from non-supportive relationships and thus render them beneficial for one's well-being (Bianco & Eklund, 2001; Ryan & Solky, 1996; Sarason & Sarason, 2009). Self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017) sheds light on this key issue by delineating what it is that makes a social partner, context, or interaction supportive.

According to SDT, autonomy (or self-determination) is a fundamental, universal, psychological need of humans. Autonomy refers to volition, congruence, and agency, also described as having a sense of ownership over one's actions (Deci & Ryan, 2000; Ryan & Deci, 2017). It is important to clarify that autonomy should not be confused with independence; instead, it denotes the pursuit of one's genuine personal interests and values (Soenens et al., 2017). Notably, parental support for autonomy is more strongly associated with adolescent psychosocial functioning than is parental support for independence (Soenens et al., 2007).

Within hierarchical relationships, the person in authority (e.g., parent or physician) is seen as more autonomy-supportive when they are empathic, informational, and supportive of one's active participation in decision making or problem solving (Mageau & Joussemet, 2023). Specifically, autonomy-supportive behaviours involve acknowledging, validating, and respecting an individual's unique perspective, subjective experience, and personal characteristics (e.g., developmental level, temperament, abilities, emotions, and preferences). Furthermore, socialization agents are autonomy-supportive when they encourage active, agentic participation in the decision-making process and use language that is informational and non-controlling, not judgmental and directive. Lastly, autonomy-supportive behaviours may also be characterized by the person in authority providing a meaningful rationale for requests, and offering some choices when possible (Deci et al., 1994; Koestner et al., 1984; Mageau & Joussemet, 2023).

Autonomy support (AS) has been found to promote individuals' motivation, learning, health, and well-being in a wide range of settings (e.g., schools, workplaces, and families) and across the lifespan (McCurdy et al., 2020; Ryan & Deci, 2017). A meta-analysis (Ng et al., 2012) demonstrated that, in health care and health promotion settings, the extent to which patients' autonomy was supported by their health care providers was positively associated with their well-being (i.e., greater positive affect, quality of life, and vitality; lower depression, anxiety, and negative affect).

As parents occupy a significant place in adolescents' social world (Smetana et al., 2015; Soenens et al., 2017), they can play a key role by nurturing rather than thwarting adolescents' need for autonomy (Joussemet et al., 2008; Mageau & Joussemet, 2023; Ryan & Deci, 2017; Soenens et al., 2017). Numerous studies on parental AS report a positive association with child and

adolescent psychosocial adjustment (see Vasquez et al., 2016, for a meta-analysis). To date, given that studies that have investigated AS in health-related contexts tended to focus on adult patients, the contributions of AS provided by parents and by health care providers to young patients is still unclear. Yet parents can be a crucial social resource for their injured adolescent by providing encouragement, reassurance, and educational information (Podlog et al., 2012). Based on SDT and prior studies (Ng et al., 2012; Vasquez et al., 2016), AS from both health care providers and parents has the potential to foster the SWB of knee-injured adolescents.

Present Study

The present prospective study aims to investigate the following question: What individual and combined contributions to the SWB of knee-injured adolescents are associated with the AS provided by two socialization agents — parent and physician — involved in their recovery? We expected that a perception of greater parental and physician AS would be positively associated with later SWB. We planned to adjust for baseline levels of SWB, AS from various sources, and potential confounders, including adolescents' age (Ronen et al., 2016), gender (Esteban-Gonzalo et al., 2020), knee function (Boykin et al., 2013), and athletic identity (Manuel et al., 2002).

Method

Procedure

This study was conducted at the Shriners Hospital for Children®-Canada, a university-affiliated, paediatric orthopedic hospital. Ethical approval was obtained from McGill University's institutional review board (A00-B58-21B). Prior to data collection, written informed consent and assent were obtained from all participants and the legally authorized representatives of patients under age 14.

From October 2021 to May 2022, patients from the hospital's sports medicine clinic were recruited by a clinical research coordinator during their consultation visit. Eligible patients met the following criteria: (a) being able to read and write English or French, (b) being between 10 and 19 years of age, as per the World Health Organization's definition of adolescence (World Health Organization, n.d.), and (c) having a knee injury/pathology. Exclusion criteria included the presence of ipsilateral hip pain, ankle pathology or pain, or inflammatory disease.

The first author was responsible for data collection, which was conducted at five time points over 3 months. All questionnaires were administered electronically and sent to participants using Qualtrics survey software (Provo, Utah). Participants were asked their preferred language (English or French) and means of communication (email or text message) for receiving their questionnaires. While waiting to see their knee physician, patients were invited to fill out a baseline questionnaire (T0), which assessed their sociodemographic characteristics, their knee function, the degree to which they identify with the athlete role, the extent to which the parent or caregiver most involved in their medical care was generally autonomy-supportive, and their SWB. Completion took place

in the waiting room or a private room using their personal electronic device. The first author was present during completion (at T0) to offer assistance if needed and to ensure that parents, when present in the room as per participants' request, let their adolescent answer by themselves. The same day, participants were sent a short questionnaire after their appointment to assess the extent to which their physician was autonomy-supportive (T1). Every month for 3 months thereafter (T2, T3, and T4), they were invited to assess their SWB. Participants had a one-week window to complete each of these questionnaires; reminders were sent to non-respondents. At each month of data collection, participating patients were compensated upon completion with a $5 CAD gift card.

Participants

The sample comprised 46 participants, with an end-of-study retention rate of 95.7% ($N = 44$). Participating patients were between 11 and 18 years old ($M = 14.7$; $SD = 1.87$). In terms of gender, 60.9% ($n = 28$) identified as girls or women, 37.0% ($n = 17$) identified as boys or men, and 2.2% ($n = 1$) did not answer this question. About half of the participants were French-speaking ($n = 24$; 52.2%) and the remainder were English-speaking ($n = 22$; 47.8%).

Participating adolescents predominantly self-identified as only White ($n = 21$; 45.7%), with fewer self-identifying as only Black ($n = 4$; 8.7%), Arab ($n = 3$; 6.5%), Asian ($n = 3$; 6.5%), or Latin American ($n = 2$; 4.3%). In this sample, seven (15.2%) self-reported as multiracial/ethnic, five (10.9%) reported "other," and one (2.2%) did not identify their racial and ethnic heritage.

Most participating patients lived in a nuclear family ($n = 31$; 67.4%), with small percentages living in a stepfamily ($n = 4$; 8.7%) or shared custody ($n = 3$; 6.5%). One (2.2%) participant lived in a foster family, two (4.3%) reported living in other family arrangements, and 1 (2.2%) did not respond. Mothers were the parent most frequently involved in participants' medical care ($n = 33$; 71.7%), followed by fathers ($n = 12$; 26.1%), and friends ($n = 1$; 2.2%).

With regard to socioeconomic status, participants were asked the highest education level attained by the parent or caregiver that was most involved in their medical care. For the majority, this was a university degree at the graduate ($n = 13$; 28.3%) or undergraduate ($n = 13$; 28.3%) level, followed by a completed post-secondary school diploma ($n = 12$; 26.1%). The remainder of primary medical caregivers held a high school diploma ($n = 6$; 13.0%) or had completed primary school ($n = 1$; 2.2%). One (2.2%) participant did not report parent education attainment.

The most common knee injuries among the participants were anterior cruciate ligament sprain or tear ($n = 11$; 23.9%), patellofemoral syndrome ($n = 9$; 19.6%), patellar instability ($n = 6$; 13.0%), and osteochondritis dissecans ($n = 5$; 10.9%). Almost one third of participants had other knee conditions ($n = 15$; 32.6%). Half of the participating patients had sustained a sports-related injury to their knee ($n = 23$; 50.0%).

Lastly, 33 (71.7%) participants reported practising sports. Among these 33 patients, a total of 19 different sports were listed, including soccer ($n = 9$; 27.3%), basketball ($n = 5$; 15.2%), and

dance (*n* = 3; 9.1%). Only 2 (6.1%) had competed at the international level. The majority had competed at the regional (*n* = 12; 36.4%), provincial (*n* = 7; 21.2%) or national (*n* = 6; 18.2%) levels; six (18.2%) had practised their sport at the recreational level.

Measures

Sociodemographic and clinical information

At baseline (T0), participants were asked to indicate their age, gender, racial and ethnic heritage, household situation, parent education attainment, and sports-related activities. The type of knee injury pathology they were diagnosed with was retrieved from their medical records.

Knee function

The Pediatric International Knee Documentation Committee (Pedi-IKDC; Kocher et al., 2011) or its validated French version (Nazon et al., 2023) was used to evaluate participants' knee function at T0. The Pedi-IKDC assesses knee-related pain, symptoms, and physical functioning during daily and sports activities across 15 items using Likert-type or binary scales (e.g., "What is the most you can do on your injured knee most of the time?"). A final score is calculated out of 100, with higher scores representing better knee function and fewer symptoms (Kocher et al., 2011). The Pedi-IKDC has demonstrated strong internal consistency (α = .91) and construct validity (Kocher et al., 2011). In the present study, its internal consistency was good ($\alpha_{English}$ = .87; α_{French} = .83).

Athletic identity

The 7-item Athletic Identity Measurement Scale (AIMS; Brewer & Cornelius, 2001) or its validated French adaptation (Mette et al., 2011) was used at T0 to assess the extent to which participants identified with the athlete role (e.g., "Sport is the most important part of my life"). Participants' agreement with each statement was rated using a 7-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). A total AIMS score is obtained by summing answers on all items; higher scores correspond to a stronger athletic identity. The psychometric properties of the AIMS suggested good reliability (α = .81) and convergent validity (Brewer & Cornelius, 2001). In the current sample, its internal consistency was good ($\alpha_{English}$ = .88; α_{French} = .88).

Parental autonomy support

The Perceived Parental Autonomy Support Scale (P-PASS; Mageau et al., 2015) was used to measure perceived parental AS at T0. Participants were first invited to identify the parent or caregiver who "is the most involved in [their] medical care". The P-PASS includes 24 items, subdivided into two subscales, each covering several topic areas: (a) AS (e.g., choice within certain limits, rationale for demands and limits, and acknowledgement of feelings) and (b) controlling (e.g., threats to punish, performance pressures, and guilt-inducing criticisms). Example items are "My parents encourage me to be myself" and "My parents use guilt to control me". Items are presented on a 7-point Likert scale, ranging from 1 (*Do not agree at all*) to 7 (*Very strongly agree*). An overall score was computed by averaging AS items with the reverse-scored controlling items.

Higher scores indicate greater parental AS versus controlling parenting, as perceived by adolescents. This self-report questionnaire has been validated in both French and English (Mageau et al., 2015). The P-PASS was found to possess high internal consistency ($\alpha > .89$) as well as convergent and divergent validity (Mageau et al., 2015). In the present study, its internal consistency was excellent ($\alpha_{English} = .94$; $\alpha_{French} = .91$).

Physician autonomy support

An adaptation of the short version of the Health Care Climate Questionnaire (HCCQ; Williams et al., 1996) or its validated French version (Czajkowska et al., 2017) was used to measure the extent to which patients perceived their knee physician as autonomy-supportive at T1. It contains 6 items, such as "I feel understood by my physician". In the present study, the response scale ranged from 1 (*Strongly disagree*) to 5 (*Strongly agree*) and we replaced the word "physician" with "knee doctor," as being more readily understood by a paediatric population. A scale score was calculated by averaging the item scores, with higher scores indicative of higher levels of AS. The HCCQ has shown strong internal consistency ($\alpha = .95$) and construct validity (Williams et al., 1996). The internal consistency in the present study was acceptable in French ($\alpha = .73$) and excellent in English ($\alpha = .90$).

Subjective well-being

A composite measure of SWB was obtained by averaging positive affect, life satisfaction, and reversed negative affect scores ($\alpha_{T0} = .90$; $\alpha_{T2} = .89.$; $\alpha_{T3} = .88$; $\alpha_{T4} = .92$; see Diener et al., 2009, for a similar procedure).

The Scale of Positive and Negative Experience (SPANE; Diener et al., 2010) or its validated French adaptation (Martin-Krumm et al., 2015) was administered at all time points except T1. This self-report questionnaire comprises two 6-item subscales: (a) positive feelings (e.g., "Happy") and (b) negative feelings (e.g., "Angry"). Participants were asked to rate the frequency with which they experienced each affective state over the past week. Responses are given on a 5-point Likert scale, ranging from 1 (*Very rarely or never*) to 5 (*Very often or always*). The SPANE is a valid and reliable tool ($\alpha \geq .81$; Diener et al., 2010). In the present study, its internal consistency ranged from good to excellent ($\alpha_{English} = .83–.87$; $\alpha_{French} = .84–.90$).

The Satisfaction With Life Scale (SWLS; Diener, 1985) or its French version (Blais et al., 1989) was used to measure cognitive judgments of satisfaction with one's life as a whole. It consists of 5 items, such as "In most ways my life is close to my ideal". Participants were invited to complete this self-report questionnaire at all time points except at T1. Ratings are made on a 7-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The initial development and validation study demonstrated high internal consistency ($\alpha = .87$) and construct validity (Diener, 1985). The SWLS has also been validated in adolescent samples (e.g., Bacro et al., 2019; Neto, 1993). In the present study, its internal consistency was acceptable to excellent ($\alpha_{French} = .69–.89$; $\alpha_{English} = .85–.94$).

Plan of Analyses

Preliminary analyses

Data were analyzed using SPSS software version 26 for Windows (IBM Corporation, United States). We first screened continuous data for normality, outliers, and reliability. We also conducted descriptive statistics to define and describe key variables, using means and standard deviations, as well as possible and observed ranges. Next, bivariate correlations were performed as an initial test of our hypotheses as well as to identify which of the potential covariates (participants' age, gender, baseline knee function, athletic identity) should be included in further preliminary analyses.

Before running the principal multiple linear regression analyses, their assumptions were assessed. The normality of residuals, homoscedasticity, and linearity were verified by plotting residuals versus the fitted predicted values. Multicollinearity was detected by correlation matrix, variance inflation factors, and condition indices (Field, 2013).

Finally, to control for potential confounding factors while preserving statistical power as much as possible, SWB at T2, T3, and T4 was regressed on the previously identified covariates. We saved residual scores, which then served as dependent variables in the principal multiple linear regression analyses. These scores represent the remaining variance in SWB after the variance that can be estimated from key confounding variables is controlled.

Main analyses

We conducted a series of three multiple linear regressions (one for SWB 1 month [T2], 2 months [T3], and 3 months [T4] after the beginning of the study). These tested whether perceived AS from the caregiving parent and the physician uniquely predicted SWB at each time, controlling for its baseline level. One should keep in mind that these analyses are conservative as they tested whether perceived AS predicted SWB over and above (a) confounding variables (using residual scores) and (b) what could be expected from initial SWB ratings (as SWB at T0 was controlled for).

Results were considered statistically significant at $p < .05$. However, given the small sample size, we focused on effect size estimates to interpret results (Sullivan & Feinn, 2012). Correlation and beta coefficients were interpreted based on guidelines proposed by Cohen (1988) for small ($r \geq .10$), medium ($r \geq .30$), and large ($r \geq .50$) effects.

Results

Preliminary Analyses

Descriptive statistics are presented in Table 1. One outlier was found (on physician AS), which was winsorized to 3.29 standard deviations from the mean to reduce its impact during analyses

(Tabachnick & Fidell, 2013). All variables had normal or near-normal distributions (skewness between −1.16 and 0.17; kurtosis between −0.96 and 1.51; Curran et al., 1996).

Table 1. *Descriptive Statistics for Study Variables*

Variable	*n*	*M*	*SD*	Range	
				Possible	Observed
Age (T0)	45	14.67	1.87	10–19	11–18
Knee function (T0)	45	62.44	14.88	0.00–100.00	28.26–92.39
Athletic identity (T0)	45	33.16	10.84	7.00–49.00	7.00–49.00
Parental AS (T0)	46	5.50	0.87	1.00–7.00	3.21–7.00
Physician AS (T1)	45	4.33	0.69	1.00–5.00	2.05–5.00
SWB (T0)	46	4.07	0.73	1.00–5.67	1.83–5.21
SWB (T2)	44	3.97	0.73	1.00–5.67	2.24–5.27
SWB (T3)	44	3.99	0.68	1.00–5.67	2.16–5.31
SWB (T4)	44	4.04	0.77	1.00–5.67	2.34–5.60

Note. T0 = baseline, prior to physician consultation; T1 = baseline, after physician consultation; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up; AS = autonomy support; SWB = subjective well-being.

Bivariate correlations among key variables are shown in Table 2. SWB ratings at all time points were positively and often strongly associated with parental AS (r = .33 to .54, $p \leq .001$ to .03). There was no statistically significant relation between physician AS and SWB, but the pattern of results was in the expected direction, with small effect sizes (r = .21 to .25, p = .10 to .17). Not surprisingly, initial SWB was positively and strongly linked to later SWB at all time points (r = .62 to .69, $p < .001$).

Table 2. *Bivariate Correlations Between Variables*

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender (T0)[a]	-									
2. Age (T0)	−.04	-								
3. Knee function (T0)	−.36*	−.39**	-							
4. Athletic identity (T0)	−.39**	.11	.25†	-						
5. Parental AS (T0)	.23	−.40**	−.04	−.10	-					
6. Physician AS (T1)	−.19	−.05	.15	.19	.14	-				
7. SWB (T0)	.11	−.52**	.36*	−.08	.44**	.20	-			
8. SWB (T2)	−.13	−.49**	.28†	−.04	.49**	.24	.69**	-		
9. SWB (T3)	.04	−.40**	.28†	−.03	.54**	.25†	.62**	.79**	-	
10. SWB (T4)	−.16	−.49**	.37*	.04	.33*	.21	.64**	.81**	.79**	-

Note. T0 = baseline, prior to physician consultation; T1 = baseline, after physician consultation; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up; AS = autonomy support; SWB = subjective well-being.

[a] Gender: 1 = boys/men, 2 = girls/women.

† $p < .10$. * $p < .05$. ** $p < .01$.

Regarding potential covariates, participants' age was negatively and moderately related to SWB ratings ($r = -.40$ to $-.49$; $p < .001$). Baseline knee function was positively and moderately related to SWB ($r = .28$ to $.37$, $p = .01$ to $.07$), but the link was statistically significant only at T4. Participants' athletic identity ($r = -.04$ to $.04$, $p = .78$ to $.85$) and gender ($r = -.16$ to $.02$, $p = .32$ to $.81$) showed small to negligible associations with SWB that did not reach statistical significance. Thus, only participants' age and baseline knee function were used to predict SWB and obtain residuals, as they were significantly or marginally significantly correlated with the dependent variable.

All multiple linear regression assumptions were met. The first series of multiple linear regressions predicting SWB at T2, T3, and T4 with the identified covariates (participants' age and baseline knee function) demonstrated that these two variables together accounted for 24.8% of the variance in SWB_{T2} ($F[2,41] = 6.75$, $p = .003$), 17.9% of the variance in SWB_{T3} ($F[2,41] = 4.46$, $p = .02$), and 35.2% of the variance in SWB_{T4} ($F[2,41] = 7.97$, $p = .001$).

Main Analyses

In the final series of three multiple linear regressions, we tested whether parental AS and physician AS predicted SWB residual scores, above and beyond the influence of initial SWB. When predicting SWB at T2, the multiple linear regression revealed that baseline SWB, parental AS, and physician AS together explained 26.8% of the variance in residual scores of SWB_{T2} ($F[3,40] = 4.88$, $p = .006$). Baseline SWB was the only statistically significant predictor of SWB_{T2} residuals ($p > .05$), with a medium effect size ($\beta = .38$, $p = .02$). In this model, the effect size of parental AS on SWB_{T2} residuals was small and no longer reached statistical significance ($\beta = .18$, $p = .25$). As for physician AS, its association with SWB_{T2} residual scores was not statistically detectable ($\beta = .09$, $p = .52$) when key variables were controlled for.

When predicting SWB at T3, the second multiple linear model explained 27.5% of the variance in residual scores of SWB_{T3} ($F[3,40] = 5.05$, $p = .005$). In this multiple linear regression, parental AS was the only significant predictor of SWB_{T3} residuals, with a medium effect size ($\beta = .32$, $p = .04$), beyond initial SWB, whose positive association was no longer statistically significant in this model, despite having a positive link of medium size ($\beta = .25$, $p = .12$). Physician AS maintained its small association with SWB_{T3} residual scores, but still did not reach statistical significance ($\beta = .11$, $p = .42$).

Finally, when predicting SWB at T4, the third multiple linear regression showed that 17.4% of the variance in residual scores of SWB_{T4} can be attributed to SWB_{T0}, parental AS, and physician AS ($F[3,40] = 2.81$, $p = .05$). At this later time, only initial SWB was a significant predictor of SWB_{T4} residuals, with a medium effect size ($\beta = .37$, $p = .03$); AS from parents or physician had no predictive role ($\beta = .03$, $p = .84$ and $\beta = .09$, $p = .55$, respectively).

Discussion

The potential benefits to injured adolescents of AS provided by parents and physicians have been understudied, as most AS studies in the health research field have tended to focus on adult patients. The purpose of this study was thus to investigate the unique and additive contributions of parental and physician AS in predicting the SWB of adolescents with knee injuries.

Our results potentially highlight the influential role of parental AS in youth SWB. Indeed, parental AS was positively — and often strongly — correlated with subsequent SWB at a statistically significant level. These findings add to the body of literature supporting the positive relation between AS from significant others and youth psychosocial adjustment. For example, parental AS has been found to be positively associated with adolescents' emotional regulation outcomes (Brenning et al., 2015; Emery et al., 2017; Roth et al., 2009), lower levels of depressive symptoms (Van der Giessen et al., 2014), and higher SWB (Chirkov & Ryan, 2001; Rodríguez-Meirinhos et al., 2020). Among emerging adults, similar findings have been reported, where AS from parents, friends, and partners was linked to higher levels of SWB (Powers et al., 2008; Ratelle et al., 2013), and these beneficial effects were maintained over time (Koestner et al., 2012; Koestner et al., 2020). The overwhelming majority of studies, however, did not follow participants over time to examine the positive associations between parental AS and SWB after the occurrence of a life event that is known to have both short- and long-term effects on SWB (see Luhmann et al., 2012, for a meta-analysis). The current study thus builds on previous research by documenting adolescents' SWB experiences after knee injury in relation to key sources of support.

After controlling for key confounders (participants' age and knee function), physician AS, and baseline SWB levels, a positive and small-to-medium association between parental AS and SWB was still present, with statistical significance maintained only at T3. However, the relation between parental AS and SWB disappeared at T4, after adjusting for the above-mentioned variables. Two main methodological considerations may have contributed to the fluctuating significance of associations observed in our primary analyses. First, not only can insufficient statistical power lead to instability in the results, but it can also prevent the detection of potentially meaningful links between parental AS and youth SWB. Second, our analytical approach was conservative, as it aimed to assess whether perceived AS predicted SWB beyond the effects of confounding variables and initial SWB ratings. This cautious approach may have precluded the identification of associations. Additional research with larger sample sizes would improve the reliability of the findings and allow for more robust conclusions to be drawn.

In accordance with SDT principles (Deci & Ryan, 2000; Ryan & Deci, 2017) and the meta-analysis by Ng et al. (2012), we hypothesized that perceived AS from the physician would be associated with adolescent patient well-being. Our results partially support this hypothesis. Though not statistically significant, correlations between physician AS and SWB were positive at all time points. Moreover, their effect sizes were fairly comparable to the links reported by Ng and colleagues on the association between AS provided by health care providers and mental health

outcomes. However, and unsurprisingly, this result pattern was no longer present once the contributions of key confounders, parental AS, and baseline levels of SWB were accounted for. This lack of effect may be due to both insufficient statistical power and limited variance, as all participants consulted the same physician.

A potential explanation of the lack of associations between physician AS and patient SWB may lie in the frequency of interactions. In our sample, most patients had only a single consultation with their knee physician. While research indicates that participants can perceive and rate AS even in brief interactions (e.g., Legate & Weinstein, 2022; Williams et al., 2006), more frequent and regular exposure to AS from their physician might have had a more significant and lasting effect on their SWB. A single interaction, while sufficient for assessing perceptions of AS, may not maximize its potential benefits. Sustained and meaningful interactions could foster an environment where patients feel consistently supported in their autonomy, potentially strengthening the link between AS and their SWB. This underlines the importance of exploring whether the frequency, duration, or significance of the physician–patient relationship moderates this association.

As for participants' personal and medical characteristics, we obtained mixed results with respect to their link with SWB. First, age was strongly and negatively correlated with SWB, which is in line with prior studies on youth (Dolan et al., 2008; González-Carrasco et al., 2017; Ronen et al., 2016). Adolescence is a developmental period characterized by rapid and significant changes within the physical, social, cognitive, and emotional developmental spheres, which, paired with increasing demands, can undermine well-being and overall mental health (Keyes, 2006). Second, gender was not related to SWB in the present sample, but studies investigating youth gender and SWB have yielded contradictory results (Dolan et al., 2008; Esteban-Gonzalo et al., 2020; González-Carrasco et al., 2017; Ronen et al., 2016; Verzeletti et al., 2016). Third, findings showed that SWB decreases with impaired knee function, confirming previous related research (Boykin et al., 2013; Manuel et al., 2002; Masten et al., 2014; McGuine et al., 2012; von Rosen & Heijne, 2021). Lastly, athletic identity was unrelated to SWB in this sample. This was unexpected, as previous studies have shown moderate to strong positive associations between athletic identity and depressive symptoms following sport-related injury (see Renton et al., 2021, for a scoping review), inevitably resulting in lower SWB. A plausible reason for this discrepancy is that more than a third of the participants did not participate in any sport, or played only recreationally. These adolescents may have had less to lose, unlike elite athletes who have much more at stake in the event of injury. This echoes the findings of Green and Weinberg (2001), who found no significant relationship between athletic identity and psychological maladjustment after injury in recreational participants.

Strengths, Limitations, and Future Studies

This study presented several strengths. To our knowledge, it is the first study to examine the unique and additive associations of both parent and physician AS with the SWB of adolescent patients, particularly in a medical context. This focus represents a significant contribution to the field, as assessing perceptions of these two key socialization agents during recovery provided

valuable insights into their roles in the SWB of knee-injured adolescents. While this is a relatively new area of investigation in the clinical context, similar questions have been explored in other domains, such as education (e.g., Chirkov & Ryan, 2001; Hagger et al., 2009) and sport (e.g., Amorose et al., 2016; Chan et al., 2012; Gagné, 2003; Lemelin et al., 2022), providing both theoretical and empirical support for this line of research.

Another strength is that we assessed and controlled for adolescents' initial SWB and key covariates. This was done to isolate as much as possible the unique contribution of AS that would explain the variance in SWB beyond what could be explained by its baseline level. Moreover, the measures used in this study have all been previously validated, which adds to the quality of the research by reducing measurement error as a source of bias. Lastly, the longitudinal design of the present study represents a major strength because it allowed us to follow patients for 3 months, documenting their SWB over time and, when assessing long-term associations with AS, to do so above and beyond baseline SWB.

In addition to these strengths, limitations can be noted. First, the small sample size and limited statistical power may have hindered the detection of significant associations. Additionally, recruiting patients of a single physician contributed to a limited range in the perception of physician AS (increasing type I error probability). Further investigations with larger samples that assess the perception of AS among patients who have seen different physicians could use multilevel analyses. This would allow for greater variance in AS and prevent the risk of a ceiling effect.

Moreover, participants had sustained a knee injury, with various onsets, prior to data collection. It would thus have been all but impossible to assess the interesting issue of participants' levels of SWB before and immediately after the injury, given that some time may have elapsed between the injury onset and the beginning of the study. Regarding athletic identity, it would have been informative to assess the degree to which sports activities were prevented. We do not know whether participants continued to participate in sports, which could be a possibility. It would be relevant, in the future, to consider sports participation when examining the link between athletic identity and the well-being of injured individuals.

Finally, and importantly, the correlational design of our study precludes drawing causal conclusions. It is also quite possible that adolescents with higher SWB levels elicit more AS from their socialization agents, as indicated by previous research highlighting child negative affectivity as a risk factor for autonomy-thwarting parenting (Armour et al., 2018; van der Bruggen et al., 2010). Additionally, a study conducted by Van der Giessen et al. (2014) seems to suggest that, although a bidirectional negative association was observed between perceived parental AS and adolescents' depressive symptoms over time, the paths from depressive symptoms to parental AS were stronger than those in the opposite direction. Ideally, assessments of both AS and SWB would have been conducted at all time points, using a larger sample, in order to examine the bidirectionality of their associations.

Future research should further explore the unique role of AS with SWB, a complex yet important area of inquiry. While recognizing the importance of both the parent's and the physician's influence, one should keep in mind that this study did not seek to compare how SWB relates to youth perceptions of AS from a parent versus AS from a physician. Not only are the multiple linear regressions analyses employed in this study not suited for such a comparative analysis, but the lack of variability in the data sources for physician AS compared to parental AS prevents any direct comparison, as does the use of different questionnaires (P-PASS and short HCCQ), albeit that both are designed to assess AS. Beyond these methodological constraints, such comparisons raise a broader theoretical question about contextual validity. While SDT posits that the psychological need for autonomy is universal, it also emphasizes that the manifestations of AS can vary across different contexts, situations, and relationships (e.g., Mageau & Joussemet, 2023). These nuances emphasize the need for future studies to investigate the contextual factors that shape how AS from parents and physicians may differentially influence youth SWB.

In the same vein, Gaudreau et al. (2016) explored how two sources of AS can interact to promote positive outcomes. In our study, AS from the parent and the physician may have interacted in an additive, or even synergistic, way (i.e., adolescents who receive strong AS from both their parents and physicians may experience higher SWB). Alternatively, in a sample with greater variability in AS, these two sources may be found to interact in a compensatory–protective manner: parental AS may serve as a protective factor when physician AS is low or physician AS may compensate when parental AS is insufficient. Examining these dynamics represents an interesting and important avenue for future research.

Another promising direction for research would be to compare AS with other types of social support to better understand its unique contributions to SWB. Given the long-standing debate within the scientific community about what constitutes optimal social support (Bianco & Eklund, 2001; Ryan & Solky, 1996; Sarason & Sarason, 2009), future studies could explore and compare different conceptualizations and operationalizations of this construct. Such investigations could examine whether AS fosters a general sense of support and assess whether it offers distinct benefits beyond those of other forms of support (e.g., instrumental support). Addressing these questions would enhance our understanding of the critical features that characterize a social context, relationship, or interaction as "supportive" and of the extent to which AS influences SWB, as well as broader health, learning, and developmental outcomes across diverse contexts.

Conclusion

In conclusion, the findings of this study propose that perceived AS, particularly from parents, might mitigate the adverse impacts of knee injuries on adolescents' SWB. Consequently, pending replication, raising awareness and educating parents about the provision of AS offers a promising approach to aiding adolescents to navigate life challenges. We recommend that this study be repeated with a larger sample size to expand these findings and better understand the beneficial role of AS in youth resilience.

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