Associations Between Teasing, Quality of Life, and Physical Activity Among Preadolescent Children

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Objective This study assessed longitudinal associations between preadolescent’s physical activity engagement (PA), health-related quality of life (HRQOL), and teasing during physical activity (TDPA).

Methods 108 children completed measures of PA, HRQOL, and TDPA during fourth or fifth grade and 1 year later. Potential longitudinal associations between study variables were tested using structural equation modeling.

Results Weight status emerged as an important moderator of the structural relationships. TDPA predicted later HRQOL for children with overweight and obesity, whereas HRQOL predicted later PA in children with normal weight. Both groups demonstrated a significant association between TDPA and HRQOL cross-sectionally.

Conclusions Children with overweight or obesity who experience TDPA are more likely to report poorer subsequent HRQOL. Children with normal weight who experience TDPA are at increased risk for reduced PA 1 year later. Efforts to reduce TDPA may benefit children’s HRQOL and increase PA participation.

Key words health promotion and prevention; longitudinal research; peers; quality of life.

Regular physical activity (PA) is recommended for promotion of children’s physical and mental health. The U.S. Department of Health and Human Services and U.S. Department of Agriculture recommend that children participate in 1 hr or more of moderate PA daily (US, 2010). Unfortunately, research suggests that only 8% of U.S. children meet this standard and children’s levels of PA decline with age (Troiano et al., 2008). Levels of activity begin to decline between ages 10 and 15, a period thought to be critical in the development of obesity in adolescence (Spadano, Bandini, Must, Dallal, & Dietz, 2005). These findings suggest that at the time when PA could have the greatest preventive importance, PA levels are declining.

Recent research has indicated that teasing from peers during PA is associated with reduced levels of PA among preadolescents. For example, in a cross-sectional study of fifth through eighth graders, Faith, Leone, Ayers, Heo, and Pietrobelli (2002) found that teasing during physical activity (TDPA) was associated with lower levels of PA compared with peers who experienced less criticism during activity. This relationship was stronger among girls and increased in magnitude as body mass index (BMI) increased. Furthermore, Faith and colleagues reported that TDPA was more prevalent among children with higher BMI percentiles, potentially leading to lower levels of PA among the most overweight children. In a more recent study, Storch and colleagues (2007) reported that peer victimization was negatively correlated with level of PA in a cross-sectional study of children aged 8–18 years. Similarly, Jensen and Steele (2009) found that girls who reported TDPA were less physically active than less-criticized peers, an association that was stronger among girls who were dissatisfied with their bodies’ shape or size.

Investigations examining associations between health-related quality of life (HRQOL) and PA are limited in the pediatric literature. Although adult studies have demonstrated positive associations between PA participation and HRQOL (Bize, Johnson, & Plotnikoff, 2007),
associations between these constructs among pediatric samples have been debated (Bailey, 2006). Sanchez-Lopez et al. (2009) reported that more physically active children endorse higher quality of life than their less-active peers, a finding that was maintained across weight and sex categories. Furthermore, Lacy et al. (2012) reported that PA was positively associated with HRQOL, whereas sedentary behavior was inversely related to HRQOL, in a study of adolescents. One limitation to the existing literature on these topics is that many studies have examined effects of PA on individual aspects of HRQOL (e.g., psychological well-being; Ussher, Owen, Cook, & Whincup, 2007) while omitting assessment of the multiple components comprising HRQOL (i.e., emotional, physical, social, and academic functioning). One exception is work by Shoup, Gattshall, Dandamudi, and Estabrooks (2008) demonstrating that the Pediatric Quality of Life Inventory (PedsQLTM) psychosocial and total scores were significantly lower for children who were less physically active irrespective of weight status. Even in this study it is unclear whether HRQOL leads to greater PA or vice versa. Longitudinal data with PA and HRQOL examined in the same model may be able to suggest possible causal linkages between these variables.

While peer teasing and PA have been studied longitudinally, we are not aware of studies that examine the relationship of PA and quality of life over time. Longitudinal study designs allow for assessment of temporal order and allow inference of causal direction. Moreover, the literature lacks reports of models that consider both teasing and subjective HRQOL in the same model. Longitudinal models are needed to test the impact of multiple constructs on PA within the same statistical framework because single-construct analyses are unable to account for multiple predictors simultaneously. Models including multiple potential predictors allow for analysis of each predictor in the context of other independent variables.

**Rationale for the Present Study**

This study was designed to examine longitudinal associations between two subjective constructs (i.e., HRQOL, TDPA) and self-reported PA among preadolescents. Although negative associations between teasing and PA and positive associations between PA and HRQOL have been reported in aforementioned studies, research has not yet examined the direction of influence between these variables. Although directional hypotheses asserting that teasing predicts PA and PA predicts HRQOL may be more intuitively plausible, it is possible that the opposite directional associations or a bidirectional interaction may more accurately characterize these relationships. Given the paucity of literature examining directional hypotheses regarding the association between teasing, PA, and HRQOL among youth, the present study was designed to test these associations using a longitudinal study design in a group of preadolescent children. Furthermore, because previous studies have demonstrated that these constructs are affected by weight status (Faith et al., 2002), we aimed to examine associations across weight status groups (i.e., normal weight, overweight). We hypothesized that a bidirectional association between teasing and PA would be observed in our study, indicating that these constructs interact reciprocally. Similarly, we hypothesized that bidirectional associations would be observed between HRQOL and PA. As part of these analyses, we also assessed the longitudinal measurement invariance of the relevant constructs.

**Method**

**Participants**

A volunteer sample of preadolescent participants was recruited through a Midwestern public school district. This community sample was composed of children across the weight status spectrum. Data collection occurred in two waves. The first wave was collected in the fall of 2010 and consisted of 304 eligible participants. The second wave was collected in the fall of 2011 and consisted of 108 participants from the original sample. Consent was obtained at each occasion. Reasons for attrition between assessment occasions included changing schools, moving, parents declining to provide consent, and one school declining to allow data collection at Time 2. Although we were unable to assess reasons for attrition generally, 61 Time 1 participants did not participate at Time 2 because their school declined to allow participation at Time 2 due to scheduling and time commitment concerns. Analysis of baseline characteristics (i.e., demographic and primary study variables) revealed that there were no significant differences between participants who completed both assessments and those who only participated in the initial assessment.

Eligibility criteria for participation at Time 1 included (1) the child was enrolled in either fourth or fifth grade, (2) the child spoke and read English, and (3) the child’s parent or custodial caregiver provided informed consent for participation. All students meeting these criteria were deemed eligible regardless of weight status, sex, or ethnicity. All students who were eligible for participation at Time 1 were eligible for participation at Time 2. The 108 participants completing assessments at both Time 1 and Time 2...
comprised the final study sample. Approximately one-half of the participants were female (51.9%). Although the study was conducted with a community sample, obese youth were slightly overrepresented compared with population estimates (obese = 23.1%; Ogden, Carroll, Kit, & Flegal, 2012). Demographic characteristics of the study sample are presented in Table I. Individual information regarding socioeconomic status was not available; however, the school district reported that 50.5% of children attending the six participating schools qualified for free or reduced-cost lunch. The aggregate school district percentage of children eligible for free or reduced-cost lunch was 32.2%.

Procedure

Information about the study and consent forms were sent to the parents of all children in the fifth and sixth grades of six selected elementary schools. Of the 558 consent forms sent home to parents, 354 were returned. Of the returned consent forms, 330 (93%) indicated consent for participation. Of the 330 forms indicating consent, 304 (92%) completed study measures. Participating children completed the study measures in a location determined by each school principal (e.g., classrooms, school cafeteria, school library). Research assistants read each measure aloud to the students to eliminate reading comprehension as a confounding variable in study procedures. Additional research assistants were available to ensure participant understanding of directions and compliance with instructions. These procedures were approved by the Human Subjects Committee at the third and fourth authors’ institution.

Measures

Physical Activity

PA was measured using the Fels Physical Activity Questionnaire (Treuth, Hou, Young, & Maynard, 2005). This measure was developed for use with preadolescents and has been validated in a sample of fifth-grade students. The measure consists of a list of 21 physical activities. Children are asked to report their engagement in the activities before, during, and after school. Test–retest reliability has been assessed by comparing self-report and interview reports, which yielded correlations between .64 and .79. Comparisons between child self-report and objective measures (heart rate, accelerometer) of PA indicate that self-reports of PA in preadolescents provide valid results in relative comparison studies (Corder et al., 2009).

BMI Percentile

Participants’ height (in) and weight (lbs) were collected by school nurses as part of a district-mandated health assessment conducted during the first quarter of the academic year. This information was provided to study personnel for all consenting participants. Using height, weight, age, and sex data, BMI percentiles were calculated for each individual according to Centers for Disease Control and Prevention formulas and participants were categorized based on weight status classification (i.e., underweight, healthy weight, overweight, or obese; Centers for Disease Control and Prevention, 2007). For purposes of the current study, our underweight or healthy weight group (UW/HW; N = 49) was composed of participants whose BMI percentile ranked below 85, whereas the overweight or obese group had a BMI percentile of 85 or greater (OW/OB; N = 57).

Teasing During Physical Activity

This construct was measured using a 6-item measure of TDPA developed by Faith and colleagues (2002) that employed the Perceptions of Teasing Scale (Thompson, Cattarin, Fowler, & Fisher 1995) as a prototype. This instrument asks questions about the child’s experiences with teasing during participation in PA (e.g., “People make fun of you when you play sports or exercise,” “People call you insulting names when you play sports or exercise”). Although the TDPA measure does not inquire about
weight-related teasing directly, overweight children endorse these experiences more often than their normal weight peers (Faith et al., 2002). Children rate the frequency with which they have encountered this teasing since kindergarten on a 5-point scale from 1 (never) to 5 (very often). If the child has experienced the particular type of teasing, they are asked to rate to what degree it bothered them from 1 (not upset) to 5 (very upset). This scale was originally tested with fifth- through eighth-grade children (Faith et al., 2002). Internal consistency for this measure has been reported to be good (α = .83) and scores are positively correlated with the Perceptions of Teasing Scale (r = .40; p < .001; Faith et al., 2002). Internal consistency in the present study was also good (α = .81).

Health-Related Quality of Life. HRQOL was measured using the PedsQL™ 4.0 Generic Core Scales Self-Report. This 23-item self-report measure of HRQOL yields scores on four subscales: Physical functioning (eight items), emotional functioning (five items), social functioning (five items), and school functioning (five items). Previous investigations have demonstrated that the PedsQL has sound psychometric properties, with internal consistency statistics consistently above 0.70 (Varni, Seid, & Kurtin, 2001). Internal consistency for child-reported HRQOL in the present sample was good (α = .89).

Statistical Methods
Measurement and predictive analyses were conducted using structural equation modeling (SEM) techniques in Mplus (Muthen & Muthen, 1998–2012). Missing data resulting from omitted questionnaire responses were accounted for statistically using full information maximum likelihood (FIML) model estimation (Enders, 2006). An advantage of SEM germane to this study is the ability to test bidirectional associations within the same structural model. Specifically, a variable can be analyzed as both a cause and an effect of other variables simultaneously (Farrell, 1994). Because the χ² statistic (routinely used to evaluate model fit in SEM) is highly sensitive to sample size (Kline, 2005), alternative fit statistics such as RMSEA, CFI, and NNFI were used to evaluate model fit for all confirmatory factor analysis and SEM analyses. A priori minimum thresholds for evaluating model fit were set at .90 for the CFI and NNFI and below .1 for the RMSEA (Kline, 2005). Consistent with guidelines for conducting statistical analyses using SEM (Brown, 2006), the present investigation began with a confirmatory factor analysis to establish the measurement model followed by testing nested model constraints to establish longitudinal invariance (Little, Preacher, Selig, & Card, 2007). To ensure optimal model fit, the latent HRQOL and TDPA constructs were specified using parcels (i.e., composite variables composed of several individual questionnaire items) consistent with recommendations by Little, Cunningham, Shahar, and Widaman (2002). To assist with the FIML procedure, participant school, sex, and grade in school were included as auxiliary variables, as recommended by Graham (2003) and Enders (2006). Following specification of the measurement model, sequential model comparisons constraining: (1) factor loadings, (2) intercepts, (3) latent means, and (4) residuals for the HRQOL and TDPA constructs from Time 1 to Time 2 were specified. After establishing invariance of the factor loadings, we assessed structural regression paths in the hypothesized models. Assessment of autoregressive structural paths allows for future studies to make informed judgments about the performance of the HRQOL and TDPA constructs over time. Nested model comparisons were assessed using both the χ² difference test (significant at p < .05) and the Cheung and Rensvold (2002) criteria of ΔCFI ≤ − .01 as the significance threshold. Due to the longitudinal nature of the data, manifest variable residuals were allowed to covary freely across time.

Path Analysis
Once longitudinal invariance was assessed, summary scores were created for HRQOL and TDPA, and a full two-wave panel model with each Time 2 variable regressed on itself at Time 1 (autoregressive paths) and each dependent variable at Time 2 regressed on all other independent variables at Time 1 (cross-lagged paths) was specified. All variables measured at the same time point were allowed to correlate with each other. The benefit of a longitudinal path model is that when associations are observed between variable X at Time 1 and variable Y at Time 2, but not vice versa, it suggests that variable X may have some causal influence on variable Y. Such knowledge is not available from cross-sectional data. The path analysis described earlier was tested in both the group with UW/HW and the group with OW/OB to test weight status as a moderator variable. With two-wave data, the initial panel model is fully saturated or just identified, meaning that it has no degrees of freedom and model fit is trivially perfect (Klein, 2005). After specifying the saturated model, a model pruning approach was used to constrain nonsignificant paths to zero in each group one at a time, as recommended by Klein (2005). After imposing each constraint, a chi-square difference test was conducted to determine whether the model fit was significantly different after imposing constraints across groups. This procedure was applied first in the normal weight group and then the overweight and obese group until all correlations and regression paths were significant. All structural paths were evaluated for both
groups, but nonsignificant paths were pruned in the final model. For nested model comparisons of structural paths within the final measurement model, chi-square change tests were considered significant at the \( p < .05 \) level. This procedure allows for direct comparisons of structural paths across weight status groups (e.g., TDPA predicts HRQOL in the OW/OB group but not in the UW/HW group).

**Results**

**Data Screening**

Consistent with previous reports on HRQOL in community samples (Cushing & Steele, 2012), the physical scale of the PedsQL produced one item with no variance. Specifically, all children answered “never” to the item addressing showering or bathing independently. Therefore, this item was eliminated from the estimation of the HRQOL construct.

**Table II. Descriptive Statistics for the Model Variables (N = 108)**

<table>
<thead>
<tr>
<th>Study Variable by Weight Status Group</th>
<th>Time 1 Mean (SD)</th>
<th>Time 2 Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal weight (n = 49)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teasing</td>
<td>9.06 (3.73)</td>
<td>9.41 (5.58)</td>
</tr>
<tr>
<td>Physical activity</td>
<td>8.72 (1.72)</td>
<td>9.06 (1.56)</td>
</tr>
<tr>
<td>HRQOL1</td>
<td>12.03 (10.59)</td>
<td>11.56 (11.65)</td>
</tr>
<tr>
<td><strong>Overweight (n = 57)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teasing</td>
<td>9.51 (4.95)</td>
<td>9.66 (5.13)</td>
</tr>
<tr>
<td>Physical activity</td>
<td>9.04 (1.62)</td>
<td>9.26 (1.85)</td>
</tr>
<tr>
<td>HRQOL1</td>
<td>13.45 (11.43)</td>
<td>15.90 (12.74)</td>
</tr>
</tbody>
</table>

Notes. HRQOL = health-related quality of life; SD = standard deviation; 1 = the PedsQL data were analyzed in their raw form (0–92, with higher scores indicating poorer quality of life). The sign was changed for significant regressions to aid in interpretation.

**Longitudinal Measurement Invariance**

Our test of the primary hypothesis (i.e., the goodness of fit of the specified model) was predicated on the longitudinal measurement invariance of the constructs assessed from Time 1 to Time 2. To ascertain this, we first specified a configural model with latent covariances free at both Time 1 and Time 2, but no autoregressive or cross-lagged paths. As noted earlier, manifest variable residuals were allowed to covary freely over time. This model demonstrated good fit to the data, \( \chi^2 (58, n = 108) = 76.58, p = .05, \) RMSEA = .05, CFI = .98, NNFI = .96. Using sequential nested model comparisons, we established invariance of the factor loadings (\( \Delta \text{CFI} = -.001 \)), means and intercepts (\( \Delta \text{CFI} = -.003 \)), and residuals (\( \Delta \text{CFI} = -.004 \)) for the TDPA and HRQOL constructs, meaning that the constructs are stable over time, and differences in scaled scores should yield meaningful regression and correlation coefficients not due to measurement fluctuations.

**Path Model**

Chi-square difference tests conducted after constraining each nonsignificant structural path to zero one group at a time were all nonsignificant, indicating that weight status moderated the associations between study variables presented further. The final path model estimated from scaled scores (Table II) demonstrated good fit to the data, \( \chi^2 (18, n = 108) = 21.22, p = .26, \) RMSEA = .06, CFI = .97, NNFI = .96. As can be seen in Figure 1a, significant correlations were observed between TDPA and HRQOL at Time 1 and Time 2 (\( r = -.50 \) and \( .51 \), respectively) for children with UW/HW. In addition, PA at Time 2 was significantly associated with HRQOL at Time 1, in this group (\( \beta = .31 \)). In the group with OW/OB (Figure 1b), significant correlations were observed at...
Time 1 and Time 2 for HRQOL and TDPA ($r = -0.45$ and $-0.64$, respectively). In addition, significant correlations were observed at Time 2 for TDPA and PA ($r = -0.32$) and PA and HRQOL ($r = 0.45$). There was also a significant association between HRQOL at Time 2 and TDPA at Time 1 ($\beta = -0.42$). In the model for children with OW/OB, only the autoregressive path for PA was significant.

**Discussion**

Promotion of PA remains an important priority for optimizing children’s physical and mental health. Numerous psychosocial factors including PA self-efficacy (Dishman et al., 2009), peer victimization (Storch et al., 2007), and perceived peer support for PA (Duncan, Duncan, & Strycker, 2005) have been shown to associate with PA in preadolescent children. Results of the current study provide additional insights into important correlates of PA over time and provide additional evidence that weight status is an important moderator of psychosocial correlates of PA among children. Specifically, our data suggest that quality of life is a predictor of PA engagement 1 year later for children with underweight/healthy weight (UW/HW), indicating that children with better initial quality of life are likely to engage in more PA over time. Furthermore, children with overweight/obesity (OW/OB) who experience teasing from peers during PA are more likely to report poor quality of life 1 year later. Importantly, and contrary to our hypothesis, teasing at Time 1 did not predict subsequent PA among either weight status group.

Our first hypothesis, predicting that teasing during activity and PA itself would be bidirectionally associated over the 1-year period, was not supported. Contrary to previous studies that have reported significant associations between these constructs (Storch et al., 2007), our analyses did not support significant associations between teasing and PA. One potential explanation for this discrepancy is that previous studies have examined TDPA–PA associations using cross-sectional designs, whereas our examination was conducted over a 1-year period. Additionally, it may be that the HRQOL construct accounts for the variability in PA that would otherwise be predicted by teasing. This interpretation highlights the importance of examining psychosocial constructs in the same model to minimize misinformation produced by overlapping sources of variance.

Next, we hypothesized that HRQOL and PA would be reciprocally associated over time. This hypothesis was partially supported. Specifically, study findings indicated that HRQOL at Time 1 predicted PA at Time 2 in regression analyses only for children with UW/HW. This finding contradicts previous theoretical models that have hypothesized the inverse predictive direction, assuming that level of PA participation predicts HRQOL (Lacy et al., 2012; Sanchez-Lopez et al., 2009). However, this finding is not unprecedented in the pediatric literature. Specifically, a recent study conducted by Jensen and Steele (2012) reported that HRQOL predicted weight-related teasing in a longitudinal study of treatment-seeking overweight children and adolescents, a finding that suggests that HRQOL may predict psychosocial and behavioral outcomes. Because the constructs comprising HRQOL represent functional abilities, it is plausible that HRQOL variability represents functional differences that influence PA participation. That is, children with more friends, who feel better physically, and who enjoy euthymic mood may be better able to enjoy PA.

It is also possible that an unmeasured longitudinal growth trend exists between these variables. For example, it may be that PA is predictive of HRQOL at some unmeasured point in development but that by late elementary school, the effect is no longer present. However, in contrast to Jensen and Steele (2012), HRQOL predicted PA only among UW/HW children. This finding may indicate that functional limitations are more likely to affect future PA among children with healthy weight.

Study findings provide support for our hypothesis that weight-related criticism from peers would predict later HRQOL, but was moderated by weight status such that TDPA at Time 1 predicted HRQOL at Time 2 only in children with overweight. This finding is consistent with both cross-sectional (Faith et al., 2002; Storch et al., 2007) and longitudinal (Jensen & Steele, 2012) studies that have noted significant associations between teasing from peers and HRQOL in both normal and overweight populations. One unique aspect of the present study is that it examined the associations between teasing during activity and HRQOL longitudinally. Although children were instructed to report their perceived experiences with teasing when playing active games or sports, it is possible that these circumscribed experiences may be pervasive for overweight children who are teased about weight or shape and that their teasing experiences are more salient, which may further contribute to poorer psychosocial outcomes.

Findings from the current study support the treatment of TDPA and HRQOL as invariant over time. This is significant because it provides evidence that longitudinal relationships among these constructs are due to true score associations and are not attributable to measurement artifacts. This finding is consistent with previous studies, which found the PedsQL™ to be invariant over a period of 1 year (Varni, Limbers, Newman, & Seid, 2008).
However, the use of parcels (i.e., composite variables composed of several individual questionnaire items) in the current study limits the generalizability of the invariance finding to those that specify a single, unitary HRQOL construct rather than the five-construct model (i.e., separate constructs for social, physical, emotional, and academic functioning) specified by Varni and colleagues (2008). To our knowledge, this is the first study to provide evidence that TDPA can be measured consistently over time (indicating that mean-level differences are not an artifact of measurement error). While the use of parcels limits the generalizability of the invariance finding for the measure, the demonstration of stability of the construct can be viewed as the state of the art for establishing metric invariance (Little et al., 2007).

Results from this study should be interpreted in the context of several methodological limitations. First, our study sample consisted of participants who completed measures at both measurement occasions. Attrition from Time 1 to Time 2 may have influenced the representativeness of our sample. Second, we relied on child reports of TDPA, PA, and HRQOL, which may have subjected the data to mono-method bias. Similarly, child self-reports of PA may have introduced some limitations regarding validity of measurement. However, research suggests that self-reports are acceptable for comparative studies (i.e., they generally provide accurate rank ordering and group-level estimates), despite their moderate comparative validity to accelerometer or other empirical methods for assessing PA (Corder et al., 2009). Furthermore, our study employed a generic measure of HRQOL, which may be suboptimal for measuring this construct among OW/OB youth. Additionally, our study did not assess the influence of socioeconomic status, ethnicity, or other demographic variables on constructs of interest.

These limitations notwithstanding, the current results have important clinical and policy implications. With regard to health policies within school systems, our results highlight the role of one form of peer victimization (TDPA) as a predictor of and possible precursor to compromised HRQOL 1 year later. System-wide policies designed to reduce peer victimization may help ensure opportunities for elementary-school children’s developing HRQOL. Given the direct (i.e., not mediated) associations between TDPA and HRQOL among children with OW/OB, school policy makers are encouraged to think of this form of peer victimization as a direct threat to children’s health outcomes (Haraldstad, Christophersen, Eide, Natvig & Helseth, 2011; Tsiros et al., 2009). With regard to clinical implications, our results speak to the value of HRQOL as a predictor of subsequent PA for UW/HW children. Consistent with Shoup et al. (2008), our results suggest that improvements in HRQOL may be associated with subsequent increases in PA—culminating in further health improvements. Ultimately, integrated school interventions that decrease peer victimization, increase PA, and address HRQOL components may be beneficial to children’s health.

In summary, the current study provides a unique and incremental contribution to the literature examining associations between PA and psychosocial experiences among preadolescents. Our study findings suggest that normal weight children’s HRQOL is a significant predictor of future PA engagement and that TDPA predicts future HRQOL among children with overweight. Given these results, we recommend increased efforts to address psychosocial and physical impairments associated with poor HRQOL. Improvements in HRQOL domains may lead to increased PA participation. Furthermore, we recommend that schools implement efforts to reduce teasing from peers, particularly in the context of PA participation.

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References


