

Feedback as a Source of Physical Competence Information: Effects of Age, Experience and Type of Feedback

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Extending the research by Amorose and Weiss (1998), the present study tested whether experience level moderates the interpretation of coaching feedback as a cue of ability in younger and older children, and examined how descriptive and prescriptive informational feedback are used as a source of competence information. Younger (7–10 years) and older (12–14 years) girls with either high or low experience playing softball watched a series of videotapes depicting four youth sport athletes attempting to hit a softball. After each attempt, whether successful or unsuccessful, a coach was heard giving each athlete a specific type of feedback, either evaluative, descriptive, prescriptive, or neutral. Participants then rated each athlete's ability, effort, and future expectancy of success. Although the hypothesized experience-level by age-group by feedback-type interactions did not emerge, the results showed strong feedback main effects for ability, effort, and future success. Analysis of these results suggest that feedback provides important cues for ability, effort, and future expectations of success in the physical domain, and that children use several cues of competence information in addition to the coach's feedback to derive competence information.

Key Words: ability, effort, perceived competence

There is evidence from both the educational and sport psychology literatures that perceptions of competence or ability exert considerable influence on achievement behaviors, cognition, and affect (Harter, 1998; Weiss & Ebbeck, 1996). It seems imperative, then, to discover the antecedents of these perceptions. One factor found to be important is performance-related feedback from parents, teachers, and coaches (see Horn & Amorose, 1998; Horn & Harris, 1996). However, the explanation provided in the literature is limited. There are contradictory findings on age-related differences when interpreting various forms of adult feedback as positive or negative cues of ability. The literature has also been primarily limited to examining evaluative feedback and has not considered other potentially important forms of feedback commonly provided by adults in the physical domain. Finally, there has been little consideration of the effect of task familiarity on children's interpretation of the feedback. The purpose of this study was to address these is-

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sues by examining how coach feedback is used as a cue of physical ability information, and to determine the effects of age, experience level, and type of feedback on this process.

One common form of feedback provided by coaches is evaluative feedback. Horn (1987) has defined it as feedback that expresses an adult's approval or disappointment in a child's behavior or performance attempt. Evaluative feedback goes beyond simple acknowledgment of the performance attempt or outcome to reveal the adult's evaluation (i.e., the worth or merit) of the performance. Praise ("Excellent job!") following a performance success, and criticism ("Come on, that was awful!") following performance errors are examples of evaluative feedback.

There is a common belief that providing praise should result in children feeling good about themselves, whereas criticism should have the opposite effect (Horn, 1987). However, research in the academic domain suggests this is not always the case (see Graham, 1990; Meyer, 1992). Praise has been identified as a cue of high ability relative to neutral feedback (i.e., simple knowledge or results), and criticism as a cue of low ability for children under 11 years of age, whereas the opposite pattern has emerged for children older than 11 years (Barker & Graham, 1987; Meyer et al., Bachman, Biermann, et al., 1979). Thus, whether evaluative feedback is seen as a relatively positive or negative cue of ability depends on the child's age.

The key to understanding these results is that children believe adults base their feedback on the level of effort a child invests in the task (Barker & Graham, 1987; Harari & Covington, 1981; Pintrich & Blumenfeld, 1985). Starting around the age of 5, children associate praise with high effort and criticism with low effort. As children under 11 years of age view ability and effort as undifferentiated (Fry & Duda, 1997; Nicholls, 1989), they would view praise as a cue of high ability and criticism as a cue of low ability. However, because children older than 11 years view effort and ability as differentiated (e.g., having to exert more effort to reach a similar level of performance indicates lower ability), it follows that an opposite pattern of results would occur for them. That is, praise following success indicates that the child tried harder to achieve that success vs. a child who received no such praise following the same outcome. Hence, the latter must be more able than the former. In the same way, criticism following failure suggests higher ability than does a neutral reaction to the same outcome.

Given the important implications of these results for coaching effectiveness (i.e., the liberal use of praise advocated by coaching education programs may not always be the best way to facilitate positive perceptions of ability for young people), Amorose and Weiss (1998) set out to determine whether the age-related differences found in the academic domain could be replicated in the physical domain. In addition to evaluative feedback, they also examined the role of informational feedback as a cue of ability. According to Horn (1987), informational feedback refers to a response, either to a performance success or mistake, in which the coach provides skill-relevant information to instruct the child in some way (e.g., "You need to keep your swing level").

Research has found that a high frequency of informational feedback is positively related to perceptions of ability in young athletes (e.g., Black & Weiss, 1992). However, Amorose and Weiss wanted to determine whether there were developmental differences in the meaning attached to this type of feedback. The study had younger (ages 6–8) and older (ages 12–13) children watch videotaped scenarios

that depicted youth sport athletes either successfully hit a baseball/softball or miss it. Following each performance attempt, a coach was heard providing each athlete with a specific type of feedback. The participants were then asked to rate the athletes' ability, as well as their effort and future expectancy of success. Unlike studies in the academic domain (e.g., Barker & Graham, 1987), Amorose and Weiss found no developmental differences in the use of evaluative or informational feedback as cues of ability. Following successful performance attempts, athletes who received praise from their coach were rated as having higher ability than athletes who received neutral feedback (e.g., "That's a hit") or informational feedback. Following unsuccessful attempts, athletes who were criticized by their coaches were rated as having lower ability than those who received either neutral or informational feedback. This pattern was the same for both the younger and older participants.

Amorose and Weiss (1998) discussed possible explanations for the lack of developmental differences, one being the potential confound of experience level or task-specific knowledge on the use of certain sources of competence information. Responses to open-ended questions posed following the videotapes suggested that older children were less likely to use the coach's feedback and more likely to use technique cues to rate the athlete's ability. It was suggested that they might have had more experience and thus a more extensive knowledge base from which to draw conclusions about performance (see Gallagher, French, Thomas, & Thomas, 1996; McPherson, 1993). This tendency to extract ability cues directly from task performance rather than through an interpretation of the coach's feedback would have prevented any interpretation of effort at all, and thus rendered developmental differences in this regard meaningless. In other words, the hypothesized developmental difference may appear only in those with little or no experience, who need to rely more on the coach to interpret the athlete's performance. The present study was designed to examine this possibility by testing whether experience level interacts with age and feedback type.

In addition to looking at evaluative feedback, Amorose and Weiss (1998) examined the role of informational feedback as a source of competence information. They hypothesized that informational feedback would serve as a positive cue of ability. This prediction, which was based on the suggestions of Horn (1985, 1987; Horn, Lox, & Labrador, 1998), assumed that coaches who provide athletes with informational feedback, particularly following skill errors, are indirectly telling athletes that they are capable of performing better in the future. This expectation of future success would in turn be interpreted by an athlete as a cue that the coach believes he or she possesses high ability.

Results confirmed these predictions following unsuccessful performance attempts. That is, athletes who received informational feedback after missing the ball were perceived by both older and younger children as possessing higher ability vs. athletes who received criticism or neutral feedback. Following successful performance attempts, however, the results were contrary to the hypothesis. Specifically, Amorose and Weiss (1998) found that athletes who received informational feedback following a successful attempt were rated as having lower ability than athletes who received praise or neutral feedback.

It is difficult to extract concrete recommendations from Amorose and Weiss (1998) regarding the use of informational feedback, however, as the type of information given changed with the outcome of the task. When successful, children

were informed of an aspect of their movement that was correct (e.g., “Your swing was level”); but when they failed, they were informed of something that needed to be changed (e.g., “You need to keep your eye on the ball”). The former seems more positive in that it indicates something that was done correctly, whereas the latter may be seen as more negative because it implies an error in the swing technique that needs to be corrected. In the literature on motor learning, these two types of feedback are known, respectively, as descriptive and prescriptive (Magill, 1994; Newell, 1991). The difference in ability ratings may have emerged because informational feedback focuses on movement cues whereas evaluative and neutral feedback focuses on pure outcome. Or it may have been due to the informational feedback being descriptive rather than prescriptive. To resolve this question, both descriptive and prescriptive feedback were provided in the present study for participants to evaluate.

To summarize, several issues remain unresolved in this area of research, and the present study attempted to address these by extending the research of Amorose and Weiss (1998). Specifically, this study tested whether there are developmental differences in the interpretation of feedback as cues of physical ability, and sought to determine whether task experience moderates any age related differences. Further, this study attempted to determine how additional forms of feedback (i.e., descriptive and prescriptive informational feedback) serve as cues of ability.

Consistent with research in the academic domain (Barker & Graham, 1987; Meyer et al., 1979), it was expected that developmental differences would emerge in the interpretation of evaluative and neutral feedback as a cue of ability. However, it was hypothesized that this age-group by feedback-type interaction would only emerge in participants who had no previous task experience. Hence a three-way interaction between age, experience, and feedback type was expected. Specifically, when athletes hit the ball, younger participants were expected to rate athletes receiving evaluative feedback as having more ability than those receiving neutral feedback, while older inexperienced participants were expected to rate athletes receiving evaluative feedback as having less ability than those receiving neutral feedback. When athletes missed the ball, younger participants were expected to rate athletes receiving evaluative feedback as lower in ability than those receiving neutral feedback, whereas inexperienced older athletes were expected to rate those receiving evaluative feedback as having more ability than those receiving neutral feedback.

The hypothesized results for ability rating were linked to the expected results for effort ratings, where a feedback-type by experience-level interaction was predicted. Consistent with Barker and Graham (1987), relative to evaluative feedback, neutral feedback was expected to be a negative cue of effort for successful outcomes, but a positive cue for unsuccessful outcomes, for *both* younger and older participants. However, this pattern was expected only for participants who were inexperienced and thus likely to use the coach’s feedback as a source of information with which to evaluate the athletes. When combined with the expected positive correlations between effort and ability ratings of younger participants, and the negative correlations expected for older participants, developmental differences were expected to emerge in the interpretation of feedback as a cue of ability found in the academic domain.

As for the distinction between descriptive and prescriptive informational feedback, Horn (1985) suggested that such informational feedback would be inter-

preted as a more positive cue of ability than neutral feedback, given that the former would indirectly tell the athlete he or she is capable of performing well in the future. Thus, informational feedback would result in higher expectations of future success, at least among the inexperienced participants who presumably will rely on the coach's feedback to evaluate the athletes. Given the expected positive relationship between future expectations of success and ability, then, informational feedback would be seen as a positive cue of ability. Nevertheless, these predictions were tentative, as Amorose and Weiss (1998) found that information feedback served as a positive cue for ability following unsuccessful outcomes, but as a negative cue following successful outcomes. One purpose of the present study was to examine whether the pattern observed by Amorose and Weiss persisted for both prescriptive and descriptive informational feedback.

Methods

Participants

A total of 110 girls recruited from local elementary and middle schools initially participated in the study. Girls were used because they were likely to have a broader range of experience with the physical task in this study. Participants were included in the final sample if they met both the age group and experience level criteria. In terms of age, participants had to be 7–10 years or 12–14 years of age. These age groups were selected based on Nicholls' (1989) suggestion that children in these age ranges vary in their notions of ability and effort. In terms of experience level, participants were included in the final sample if they reported having no experience, which was operationalized as having never played on an organized softball or T-ball team, or if they had at least one full season of organized T-ball or softball.

Based on these criteria, the final sample included 73 participants. In the younger group ($n = 35$, $M = 9.01 \pm 1.01$ years), 19 participants had no previous softball experience while the other 16 had played at least one full competitive season ($M = 1.75 \pm 1.18$ seasons). The older group ($n = 38$, $M = 12.95 \pm 0.54$ years) consisted of 20 participants who had no experience and 18 who had more than one full season of playing experience ($M = 4.28 \pm 1.90$ seasons). Standard Institutional Review Board procedures were used in obtaining permission to participate from the schools, parents, and children.

Procedures

All participants were tested in small groups in their own school. Each was assigned to an experimenter, who read all questions and recorded the participant's responses. Each participant and her assigned experimenter were seated far enough away from the others to avoid hearing their responses. Initially the girls were asked to answer questions related to their age and how much experience they had hitting a softball off a tee (7- to 10-year-olds) or tossed by a coach (12- to 14-year-olds). Specifically they were asked: (a) whether they had ever played organized softball or T-ball in a league with a coach; (b) if so, how many full seasons they had played; and (c) how much they felt they knew about playing softball or T-ball (response options for this question ranged from "not much at all" to "a whole lot" and were scored on a 5-point scale, with higher scores reflecting more knowledge).

Videotapes. Participants were told they would see a videotape depicting youth sport athletes attempting to hit a softball during a team practice, and that they would hear the coach tell the athletes how well they did. The participants were told we were interested in their assessment of how good each athlete was at hitting a softball (ability), how much each athlete tried to hit the ball (effort), and how well each athlete would perform the next time she tried to hit the ball (future expectations of success). The questions regarding effort and future expectations of success were included because they have been identified as factors that may help explain how various types of coaching feedback might serve as sources of competence information (Amorose & Weiss, 1998; Barker & Graham, 1987; Horn et al., 1998). To help the participants distinguish between the athletes on the videotapes, each athlete wore a different colored T-shirt.

Following these instructions, the girls viewed a videotape produced specifically for the present study. It consisted of two scenarios, one depicting four athletes hitting the ball and the other depicting four athletes swinging and missing the ball. The athletes shown on the videotapes were all girls of approximately the same age as the participants watching the tapes. Filming procedures included a digital video camera positioned approximately 10 feet from where a child model was set up to bat. The athletes shown on the videotape all hit right-handed and were positioned in the center of the camera screen, facing the camera. The videotapes showed each athlete from just below her chin to just above her knees. Only a limited area to the right and left of the model was shown on the videos, so as to prevent observers from seeing how well the ball was actually hit during the successful attempts (e.g., line drive, pop fly). Each model was prompted to hit the ball by one of the primary experimenters, who also filmed the performance attempts. For the successful-outcome condition, the videotape captured the ball flying off the model's bat and the audio indicated that it was a hit. For the unsuccessful conditions, the videotape clearly showed that the bat did not hit the ball. Multiple performance attempts were recorded for each model to ensure that the final version of the videotaped scenarios would include standardized performance levels across athletes in each outcome condition.

Following each attempt to hit the ball, a female coach was heard in the background giving the athlete feedback about her performance. For the successful attempts, one athlete received evaluative feedback in the form of praise: "Great hit!"; one received descriptive informational feedback: "You kept your eye on the ball"; one received prescriptive informational feedback: "You need to follow through all the way"; one received neutral feedback: "Right." Following unsuccessful attempts, one athlete received evaluative feedback in the form of criticism: "What are you doing? That wasn't even close!"; one received descriptive informational feedback: "Your swing was level"; one received prescriptive informational feedback: "You need to keep your eye on the ball"; and one received neutral feedback: "You missed." The same coach gave the feedback in each scenario. The order of presentation of successful and unsuccessful outcomes was counterbalanced within age group.

Questions About Ability, Effort, and Expectations of Success. After a scenario had played through twice, the videotape was stopped and the participants were asked to respond to three questions about each of the four athletes they observed in that scenario. To remind them of what the coach said to each athlete following her performance attempt, the participants were shown a card containing a snapshot from the performance paired with the relevant feedback from the coach.

The participants were then asked to rate each athlete's ability, effort, and future expectations of success. A 5-point Likert scale was used for each question. For the ability question, "How good do you think Player A in the gray shirt is at hitting the softball?" Response options were: not good at all; not good; so-so; good; very good. For the effort question, "How hard do you think Player A in the gray shirt tried to hit the softball?" Response options were: didn't try hard at all; didn't try hard; sort of tried; tried hard; tried really hard. For the question about future expectations of success, "How well do you think Player A in the gray shirt will perform the next time she tries to hit the softball?" Response options were: not very well at all; not very well; so-so; well; very well.

These response options were incorporated into a 5-point scale, with higher scores representing greater ability, effort, and future expectations of success. The experimenter read the questions and response options to the girl he or she was assigned to and then recorded the girl's response. After participants watched both the successful and unsuccessful scenarios and responded to all the relevant questions, the experimenter asked them what information they used "to decide that some girls were good at hitting the softball and some were not so good at hitting the softball." This open-ended question sought to determine whether the girls were using the coach's feedback as a source of information about ability, or were using some other cue such as technique or effort. Each participant was then read three closed-ended questions about the extent to which she relied on the coach's comments, the athlete's swing technique, and the athlete's effort when determining the athlete's ability. The response options for these questions were: not much at all; not much; some; a lot; a whole lot (scored from 1 to 5).

Data Analyses and Interpretation

A series of preliminary analyses were conducted. First a 2×2 (Age Group $\times$ Experience Level) MANOVA was conducted to determine whether there were age and/or experience-level differences on self-reported knowledge of hitting a softball and the use of various sources of information (e.g., coach feedback, swing technique, effort) to evaluate each athlete's ability. The participants' open-ended responses were also examined to determine whether the cues of information they used to rate each athlete's ability varied by age and/or experience level. Finally, correlations among the ratings of ability, effort, and future expectations of success were examined. The main analyses tested whether perceptions of ability, effort, and future expectancy of success varied as a function of age, experience level, and type of feedback for each performance outcome. This was accomplished through a series of $2 \times 2 \times 4$ (Age Group $\times$ Experience Level $\times$ Feedback Type) repeated-measures ANOVA.

Results

Preliminary Analyses

First a 2×2 (Age Group $\times$ Experience Level) MANOVA was conducted. The four dependent variables were the participants' responses to the questions on self-reported knowledge of hitting a softball, use of the coach's feedback, use of the athlete's swing technique, and use of the athlete's effort as a sign of ability. Results revealed a significant main effect for experience level, Wilk's λ (4, 66) = .63, $p < .05$, $\eta^2 = .37$. The age-group main effect and the age-group by experience-

level interaction were both nonsignificant, $p > .05$. Univariate F -values indicated that experienced and inexperienced participants differed in self-reported knowledge of hitting a softball, $F(1, 72) = 30.89, p < .05, \eta^2 = .31$, use of the coach's feedback, $F(1, 72) = 4.64, p < .05, \eta^2 = .06$, and use of the athlete's swing technique to evaluate her ability, $F(1, 72) = 4.47, p < .05, \eta^2 = .06$. No significant difference was found between the experienced vs. inexperienced group in using the athlete's effort as a sign of ability, $p > .05$.

As seen in Table 1, the participants with softball experience reported greater knowledge of hitting a softball and said they were less likely to use the coach's feedback and more likely to use the athlete's swing technique as a cue of ability, compared to participants with no softball experience. These results are consistent with the prediction that, compared to inexperienced participants, those with high experience would rely less on the coach's feedback and more on the player's swing technique to evaluate ability.

Table 1 Descriptive Statistics ($M \pm SD$) for Preliminary Analyses by Age Group and Experience Level

	Age group (yrs)		Experience level		Combined
	7–10 ($n = 35$)	12–14 ($n = 38$)	No exp. ($n = 39$)	Exper. ($n = 34$)	
Self-reported knowledge	3.43 ± 1.01	3.24 ± 0.88	3.46 ± 0.97	4.09 ± 0.83	3.39 ± 0.94
Use of coach's feedback	3.83 ± 0.95	3.47 ± 0.76	3.84 ± 0.88	3.41 ± 0.82	3.64 ± 0.87
Use of swing technique	3.51 ± 0.92	3.68 ± 0.96	3.39 ± 0.96	3.85 ± 0.86	3.60 ± 0.94
Use of effort	3.51 ± 1.12	3.68 ± 0.96	3.72 ± 1.00	3.47 ± 1.08	3.60 ± 1.04

In addition to analyzing the closed-ended questions, we examined responses to the open-ended question regarding sources of information used to determine ability ratings. Here each response was scored with respect to whether it noted any use of the coach's feedback, the athlete's swing technique, or the athlete's effort. The percent of responses that mentioned each cue of ability information was computed by experience level and age group. As seen in Table 2, the proportion of younger participants using each source of information was similar across experience levels. Among the older participants, however, the more experienced ones were more likely to use swing technique as a cue of ability than were the inexperienced ones, and less likely to use effort. Interestingly, these data differ from the closed-ended responses in at least two ways: (a) differences between experience levels only emerged at the older age group, and (b) there was no apparent differ-

Table 2 Percent of Open-Ended Responses Used as Sources of Ability Information

Source of ability information	7- to 10-year-olds		12- to 14-year-olds	
	No exp. (<i>n</i> = 19)	Exper. (<i>n</i> = 16)	No exp. (<i>n</i> = 20)	Exper. (<i>n</i> = 18)
Coach's feedback	63%	63%	62%	59%
Athletes' swing technique	74%	75%	38%	94%
Athletes' effort	42%	38%	48%	29%

ence in the proportion of participants using the coach's feedback as a cue of ability. It should be noted, however, that the open-ended responses were based on the percent of participants who said they used a specific cue. Open-ended responses do not differentiate between levels of use of the various sources of information in the same way as do closed-ended responses.

The final preliminary analysis examined the relationships among the participants' ratings of the ability, effort, and future expectations of success. The main purpose of this correlational analysis was to determine whether the relationships between effort and ability ratings differed between age groups. The correlations were examined separately by age group, experience level, feedback type, and outcome condition. No matter how the correlations were broken down, the results typically revealed small to moderate positive correlations between ability and effort, ability and future success, and effort and future success ($M = .40 \pm .25$, median = .44). Positive correlations were significant, $p < .05$, in 42 out of a possible 96 cases. Most important, there were no significant negative correlations regardless of age group, experience level, feedback type, or outcome condition.¹ Thus, the strong negative correlation between effort and ability found by Barker and Graham (1987) with older children was not replicated in the present study.

Main Analyses

To test whether perceptions of ability, effort, and future expectancy of success varied as a function of age, experience level, and type of feedback for each performance outcome, we conducted a series of $2 \times 2 \times 4$ (Age Group $\times$ Experience Level $\times$ Feedback Type) repeated-measures ANOVAs. The between-subjects factors were age group (ages 7–10 vs. 12–14 years) and experience level (no experience vs. experienced), while the within-subjects factor was type of coach feedback (evaluative, descriptive, prescriptive, neutral). Separate analyses were conducted on ratings of ability, effort, and future expectations of success for both the successful and unsuccessful outcomes. Based on the number of comparisons, a Bonferroni adjustment was used and a significance level of $p < .008$ was adopted. Huynh-Feldt's adjusted F -values were used for all effects incorporating a within-subjects factor, except where $\epsilon < .75$, when the Greenhouse-Geisser adjustment was used. The meaningfulness of significant effects was assessed using η^2 .

Successful Outcome Condition. The results of the ANOVA for ability ratings following the successful outcome condition revealed a significant experience-level main effect, $F(1, 69) = 7.94, p = .006, \eta^2 = .10$, and feedback-type main effect, $F(3, 207) = 31.67, p = .001, \eta^2 = .32$. The age-group main effect, on the other hand, was nonsignificant, $p > .008$, as were all possible interactions. The only interaction that approached even a traditional level of significance, $p < .05$, was the hypothesized age-group by experience-level by feedback-type interaction, $p = .053$; however, the effect size associated with this interaction was small, $\eta^2 = .04$.

The means for experience level revealed that experienced participants rated the athletes lower in ability ($M = 3.84 \pm .40$) than did those with no softball experience ($M = 4.10 \pm .37$). To examine the differences in ability ratings by feedback type, we computed pairwise comparisons and examined the effect size (ES) associated with each comparison in order to determine the meaningfulness of the difference.² Using the recommendations of Thomas, Salazar, and Landers (1991), an $ES < .41$ was considered small in magnitude, an ES between .41 and .70 was considered medium, and an $ES > .70$ was considered large. The means and standard deviations for ability ratings by feedback type are listed in Table 3, and the effect size associated with each comparison is presented in Table 4. Based on the magnitude of the differences, the athletes who received prescriptive feedback were rated considerably lower in ability than those who received evaluative or neutral feedback. Descriptive feedback also served as a negative cue of ability relative to evaluative and neutral feedback, although the magnitude of these differences was not as large as those found with prescriptive feedback.

For the ratings of effort, the only significant effect that emerged was a feedback-type main effect, $F(2.94, 203.4) = 17.54, p = .001, \eta^2 = .20$. All other main effects and interactions in this repeated-measures ANOVA were nonsignificant, $p > .008$, although the age-group by feedback-type interaction approached significance, $p = .017, \eta^2 = .05$. The descriptive statistics for the feedback main effect are listed in Table 3 and the effect size associated with each pairwise comparison is

Table 3 Descriptive Statistics ($M \pm SD$) by Feedback Type and Outcome Condition

	Ability	Effort	Future expect. of success
<i>Successful Outcome</i>			
Evaluative feedback	4.33 $\pm$.58	4.07 $\pm$.65	4.49 $\pm$.69
Descriptive feedback	3.82 $\pm$.65	4.01 $\pm$.75	4.16 $\pm$.76
Prescriptive feedback	3.48 $\pm$.73	3.53 $\pm$.69	3.85 $\pm$.81
Neutral feedback	4.27 $\pm$.73	4.23 $\pm$.70	4.34 $\pm$.75
<i>Unsuccessful Outcome</i>			
Evaluative feedback	2.06 $\pm$.71	2.69 $\pm$.81	2.89 $\pm$.70
Descriptive feedback	3.03 $\pm$.82	3.10 $\pm$.84	3.44 $\pm$.90
Prescriptive feedback	2.70 $\pm$.95	2.99 $\pm$.94	3.33 $\pm$ 1.00
Neutral feedback	2.56 $\pm$ 1.13	2.97 $\pm$.94	3.15 $\pm$ 1.01

Table 4 Effect Size for Differences Between Feedback Types in Successful Outcome Condition

Comparison	Ability	Effort	Future expectations of success	
			Ages 7–10	Ages 12–14
Evaluative vs. descriptive	.83*	.09	.67*	.41
Evaluative vs. prescriptive	1.29*	.81*	1.43*	.45*
Evaluative vs. neutral	.09	-.24	.92*	-.37
Descriptive vs. prescriptive	.49*	.67*	.83*	.03
Descriptive vs. neutral	-.65*	-.30	.35	-.81*
Prescriptive vs. neutral	-1.08*	-1.01*	-.43*	-.86*

Note: *Pairwise comparison significant at $p < .008$

shown in Table 4. Results revealed that athletes who received prescriptive feedback from their coach were rated as not trying as hard to hit the ball compared to athletes who received evaluative, descriptive, or neutral feedback.

A significant feedback main effect was also found in the analysis of future expectancy of success, $F(2.92, 201.87) = 17.52$, $p = .001$, $\eta^2 = .20$. Unlike the ability and effort ratings, however, this feedback main effect was superceded by a significant feedback-type by age-group interaction, $F(2.92, 201.87) = 10.143$, $p < .01$, $\eta^2 = .13$. All other main effects and interactions were nonsignificant, $p > .008$. Follow-up pairwise comparisons were used to explore this interaction, and the effect sizes for these comparisons are listed in Table 4. For the younger participants, athletes who received evaluative feedback ($M = 4.83 \pm .38$) were rated as most likely to succeed in future attempts, followed in turn by athletes who received descriptive ($M = 4.49 \pm .61$), neutral ($M = 4.23 \pm .84$), and prescriptive ($M = 3.86 \pm .88$) feedback.

The pattern of ratings was different, however, for the older participants. They rated athletes who received neutral feedback ($M = 4.45 \pm .65$) as the most likely to succeed in the future, followed in turn by athletes receiving evaluative ($M = 4.18 \pm .77$), descriptive ($M = 3.87 \pm .78$), and prescriptive ($M = 3.84 \pm .75$) feedback. As shown in Figure 1, the critical difference between age groups involves the ratings of future success following evaluative and descriptive feedback. The older participants viewed evaluative feedback and descriptive feedback as a significantly less positive cue of future success relative to the younger participants ($ES = 1.03$ and $.86$, respectively), while not differing in their reactions to prescriptive feedback or neutral feedback ($ES = .02$ and $-.29$, respectively).

Unsuccessful-Outcome Condition. The results of the repeated-measures ANOVA on ability ratings in the unsuccessful-outcome condition revealed a significant main effect of feedback type, $F(3, 207) = 23.38$, $p = .001$, $\eta^2 = .25$. All other main effects and interactions were nonsignificant, $p > .008$. Means and standard deviations of ability ratings by feedback type are listed in Table 3, and the effect sizes associated with follow-up pairwise comparisons are listed in Table 5.

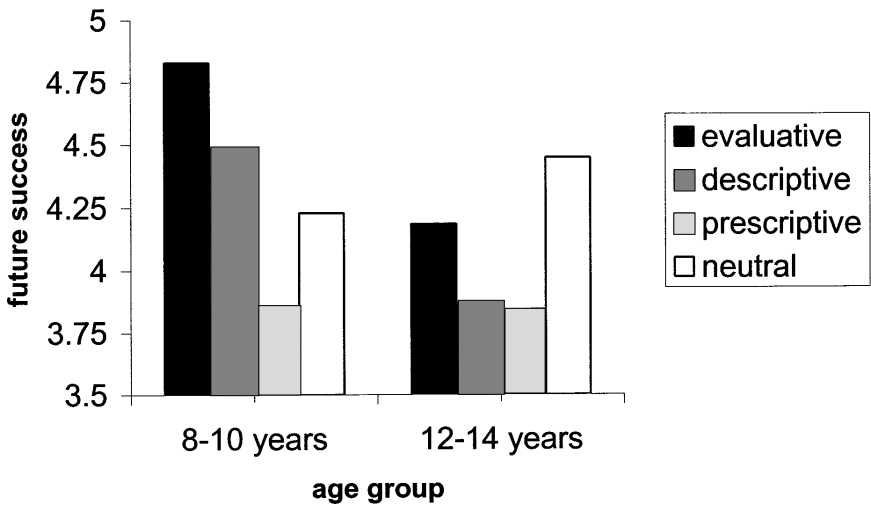


Figure 1 — Age Group by Feedback Type interaction for future expectations of success ratings following successful performances.

Table 5 Effect Size for Differences Between Feedback Types in Unsuccessful Outcome Condition

Comparison	Ability	Effort	Future expect. of success
Evaluative vs. descriptive	−1.27*	−.50*	−.68*
Evaluative vs. prescriptive	−.76*	−.34*	−.51*
Evaluative vs. neutral	−.53*	−.32*	−.30
Descriptive vs. prescriptive	.37*	.12	.12
Descriptive vs. neutral	.48*	.15	.30
Prescriptive vs. neutral	.13	.02	.18

Note: *Pairwise comparison significant at $p < .008$

Results indicated that athletes who received descriptive feedback were rated as having significantly more ability, followed in turn by athletes who received prescriptive, neutral, and evaluative feedback. The largest differences between the various types of feedback involved evaluative feedback, which was clearly seen as the least positive cue of ability.

A significant main effect for feedback type also emerged for effort, $F(3, 207) = 4.86, p = .003, \eta^2 = .07$. Once again, all other main effects and interactions in this repeated-measures ANOVA were nonsignificant, $p > .008$. The descriptive statistics relevant to the feedback main effect are listed in Table 3, and the effect

size of the differences associated with each comparison is presented in Table 5. Results indicated that athletes who received evaluative feedback following an unsuccessful attempt were rated as trying less hard than those who received descriptive, prescriptive, and neutral feedback, although the magnitude of the differences was not large.

A similar pattern of results emerged in the repeated-measures ANOVA on the rating of future expectations of success. The only significant effect was a feedback-type main effect, $F(2.95, 203.65) = 7.69, p = .001, \eta^2 = .10$. All other main effects and interactions were nonsignificant, $p > .008$. Means and standard deviations for ratings of future expectations of success by feedback type are listed in Table 3. Pairwise comparisons indicated that athletes receiving evaluative feedback from the coach were rated as less likely to perform well in the future compared to those receiving descriptive or prescriptive feedback, yet the magnitude of these differences was only moderate in size (see Table 5).

In summary, the results of the main analyses revealed that various types of coaching feedback influenced participants' ratings of the athletes' ability, effort, and future expectations of success following successful and unsuccessful performance attempts. With few exceptions, age and experience level had little influence on these ratings.³

Discussion

The primary goal of this study was to examine how children interpret coaching feedback as a cue of physical ability. We sought to extend the literature by testing whether experience level moderates the interpretation of coaching feedback as a cue of ability in younger vs. older children, and to examine how descriptive and prescriptive informational feedback are used as a source of competence information. While results indicated that the feedback did indeed influence the rating of athletes' ability, as well as ratings of effort and future expectations of success, the hypothesized patterns of relationships were generally not found.

In terms of ability ratings, we expected to find a three-way interaction between age group, experience level, and type of feedback. We expected to replicate the developmental differences found in academic research in terms of the interpretation of evaluative and neutral feedback (Barker & Graham, 1987; Meyer et al., 1979), but only with those participants who were inexperienced at the task. The hypothesized moderating effect of experience was based on the suggestions of Amorose and Weiss (1998), who argued that experienced individuals have more task-specific knowledge and thus, when watching athletes perform, can evaluate them based on swing technique rather than on the coach's feedback. Thus the attributional cues (e.g., ability, effort) provided by the coach's feedback would be ignored by the experienced participants. Individuals with little experience, however, would have to rely on the coach's feedback since they lack the task-specific knowledge required to evaluate the athletes' swing technique. Despite the findings from preliminary analyses which indicated, as expected, that the inexperienced participants were more likely to use the coach's feedback as a cue of ability and less likely to use the athlete's swing technique, the inexperienced and experienced participants alike generally interpreted the feedback as a cue of ability, effort, and future expectations of success similarly, thus the expected developmental differences did not emerge in either group.

Why the hypothesized developmental differences in the interpretation of feedback as a cue of ability did not emerge for those participants with little experience remains unclear, but this may not be surprising given the pattern of results found for rating of effort. The expected developmental differences in ability ratings were based on the rationale of Barker and Graham (1987), who suggested that (a) praise would be viewed as a cue of high effort and criticism as a cue of low effort by *both* younger and older children, but (b) younger and older children would differ in their notions of ability and effort. However, support for these results did not emerge.

Results indicated that the difference in ratings of effort following the various types of feedback was relatively small, particularly in comparing evaluative and neutral feedback. Furthermore, positive correlations between ratings of effort and ability were found for both age groups. While this would be expected for the younger participants, who have an undifferentiated notion of effort and ability, strong negative correlations were predicted for the older participants, who presumably hold a differentiated notion (Nicholls, 1989). So the rationale for expected developmental differences in the interpretation of feedback as a cue of ability provided by Barker and Graham breaks down on several levels. The reason is unclear, although a few possibilities exist.

We expected that developmental differences would only emerge for participants with little experience who, given their lack of task-specific knowledge, would rely heavily on the coach's feedback to evaluate the athletes. Nevertheless, even the inexperienced participants indicated that they had some knowledge of how to hit a softball. The mean score of self-reported knowledge for the inexperienced group was 3.46 ($SD = .97$), which in an absolute sense corresponds to the participants believing they have "some" to "a lot of" knowledge. Given the popularity of baseball/softball in the U.S., this might not be surprising. Even individuals who have not played softball on an organized team, which we used as our criteria for separating participants into experience groups, have likely been exposed to softball either by watching others play, or through informal play, or even through instruction in school physical education classes.

Since they possessed some degree of task-specific knowledge, even the inexperienced participants may have used the athletes' swing technique rather than relying solely on the coach's feedback. The fact that they cited using the athletes' swing technique as a cue to evaluate the athletes "some" to "a lot" ($M = 3.39 \pm .88$) provides some support for this argument. The key here is that using a variety of sources of information with which to evaluate the athletes, rather than only relying on the coach's feedback, may have rendered the attributional cues contained in the feedback less meaningful and yielded a pattern of results different from those found in the academic domain. Perhaps using a more sensitive measure of task-specific knowledge and/or a less popular task would allow us to more accurately identify those with little knowledge, who would likely rely more exclusively on the coach's feedback.

While the use of multiple cues of information for evaluating the athletes may be a function of experience level or task-specific knowledge, another real possibility is the nature of the task. In other words, the lack of support for the developmental differences found in the academic domain by Barker and Graham (1987) and by Meyer et al. (1979) might be linked to the qualitative aspects of the task being evaluated. For instance, Barker and Graham used an academic (mathematics) task and a physical task (tossing balls through a large hoop) and found no

differences in the pattern of results between the two tasks. However, even with the physical task they used, there does not seem to be any recommended or ideal technique for performing the task. Instead, an evaluation of success vs. failure can only be derived from the performance outcome and the teacher's feedback. The technique required to hit a softball, on the other hand, may be more salient to the performance, and thus the quality of the technique becomes another cue used in evaluating the performer.

Furthermore, the amount of effort being exerted while performing the tasks used by Barker and Graham is far less visible than is true of the task used in the present study. Indeed, one could argue that the effort being derived in Barker and Graham's study was cognitive effort, implied completely from the teacher's tone rather than diagnosed from the moving images shown in the videotape. With the softball task, however, there may be two sources of effort information, one derived from the coach's comments but the other, perhaps more tangible, derived from the physical energy invested in the shot. This information about the degree of effort is likely clear even to those without extensive task-specific knowledge. The key here is that the type of task presented may determine which cues of ability and effort are used to evaluate the performer. Thus the lack of developmental differences found in the present study, and in Amorose and Weiss (1998), who used a similar design, may be contingent upon the participants' evaluations resulting from a combination of feedback and actual performance cues instead of only the feedback cues available in Barker and Graham.

While the nature of the task in this study differs from those Barker and Graham (1987) and Meyer et al. (1979) used in the academic domain, this should not be considered a limitation of the present study, as the availability of multiple cues of ability and effort are common to all real-world sporting events. What will help determine whether there are developmental differences in the interpretation of feedback in the physical domain, however, is for future studies to create situations that isolate feedback as a source of information. For instance, studies might incorporate text presentations of the performance scenarios (see Meyer et al., 1979), or use audio presentations rather than videotaped scenarios. Also, other physical tasks that differ in the extent to which there is a recommended technique for performing the task might be examined, as this too may have introduced a moderating factor to the results. Finally, testing for domain differences within the same study might shed light on how performance feedback is ultimately interpreted as a cue of ability across different tasks.

As noted, the expected pattern of correlations between the effort and ability ratings was not found, as the older participants demonstrated positive relationships rather than the anticipated negative relationships. While this group was expected to hold a differentiated notion of effort and ability, it may be that they simply chose to adopt an undifferentiated view when evaluating the athletes. According to Nicholls (1990), once children can differentiate between effort and ability, they can choose to employ *either* a differentiated or an undifferentiated view. That is, they can view situations as task-involved (an undifferentiated notion) and/or ego-involved (a differentiated notion). Perhaps the older children in this study chose to interpret the situation using an undifferentiated notion whereby effort equals ability. The positive correlations between effort and ability provide some support for this suggestion, although simple correlations do not provide enough information to definitively determine one's notion of effort and ability (Nicholls,

1990). Future research should seek to determine how the adoption of a differentiated or an undifferentiated conception influences the interpretation of feedback.

Despite the relative lack of interactions with age and experience, the results of this study support the findings of Amorose and Weiss (1998), who found that feedback affects ratings of physical ability as well as effort and future expectations of success. Perhaps the most parsimonious explanation of the current results involves the general negativity of the message contained in the feedback. That is, it seems the various feedback types were simply interpreted according to the extent to which the feedback provided positive or negative information about the performance. Following successful performance, for example, athletes who received informational feedback, particularly in the form of prescriptive feedback, were evaluated the most negatively and received the lowest ratings of ability, effort, and future expectations of success. While prescriptive feedback provides information on how to improve in the future, and thus is not in and of itself negative, it is the only feedback that shows the coach found something wrong with the performance. Specifically, responding with "You need to follow through all the way" implies that the athlete did not perform this aspect of the swing correctly, and perhaps highlights the discrepancy between the athlete's current and ideal level of performance.

Although the two forms of informational feedback were viewed as more negative cues of ability in the successful-outcome condition, prescriptive and especially descriptive feedback were viewed as more positive sources of information in the unsuccessful-outcome condition. Thus, consistent with the predictions of Horn (1985, 1987), feedback that contains technical instruction seems to serve as a positive cue of ability and future success following performance errors. Evaluative feedback in the form of criticism, on the other hand, clearly contained the most negative message ("What are you doing? That wasn't even close!"). Consequently, this form of feedback was consistently interpreted as the least positive sign of ability, effort, and future success.

The pattern of findings on interpretation of the feedback was generally in line with Amorose and Weiss (1998), and suggests that coaches would do well to respond to athletes' performance successes with praise rather than informational feedback, and respond to performance errors with informational feedback rather than criticism. While the suggestions regarding evaluative feedback seem intuitive and support much of the field-based research (e.g., Black & Weiss, 1992; Smoll, Smith, Barnett, & Everett, 1993), avoiding informational feedback following successful performance attempts is less intuitive. For instance, the merits and necessity of prescriptive information to guide performers toward improved performance is well documented in the literature on motor learning (Newell, 1991; Smith, Taylor, & Withers, 1997). Furthermore, some research suggests that technical instruction is beneficial in terms of psychological responses such as motivation and perceptions of ability (e.g., Black & Weiss, 1992; Smoll et al., 1993). As Horn (1985, 1987) would suggest, this type of feedback should indirectly tell the athlete that the coach believes he or she can get even better, which should ultimately be viewed as a positive cue of ability.

Nevertheless, there is also research to suggest that informational feedback or instruction in general is perceived as a cue that the performer is not all that capable (see Graham, 1990; Meyer, 1992). For example, research in the classroom

setting has found that students who receive help or assistance from their teacher may be perceived as having lower ability (e.g., Graham & Barker, 1990). Thus, providing informational feedback following successful performance, which may be interpreted as getting help from the coach, may not be the best response for facilitating positive self-perceptions. It should be noted, however, that the informational feedback given in this study was quite simple and focused on the basic fundamentals of the skill. A different pattern of results might be found for more advanced technical instruction or for a more difficult task.

The ultimate goal of this line of research is to understand how feedback from a coach is interpreted as a cue of ability information, and clearly many questions remain. For example, there are many more types and combinations of feedback (e.g., lack of feedback, praise combined with instruction, punitive technical instruction) that are common to sport and therefore should be examined. Further, in the current study the children were asked to evaluate the athletes based on hearing only a single presentation of the coach's feedback. Thus the history of the feedback the coach provided to a specific athlete was not available. This may have made it more difficult for the children to decide upon the actual meaning of the coach's feedback. For instance, the criticism we expected would be a more positive cue of ability in older children without experience may simply have been taken at face value, similar to the younger children given the difficulty of inferring alternative meanings from only once piece of evidence.

Being exposed to the coach's overall pattern of feedback to an athlete over time may result in a more realistic assessment of his or her feedback and how it relates to the evaluation of the athletes.⁴ This type of presentation may also allow the participants to better assess the coach's knowledge. Meyer, Mittag, and Engler (1986), for instance, have found that the seemingly counterintuitive effects of praise and criticism in older children and adults only occurs when the evaluators believe the person giving the feedback knows the skill and ability level of the individuals receiving the feedback.

Finally, this study focused on perceptions of *other* children's ability rather than the participants' own self-perceptions. Some research in the academic domain has indicated that the way in which children evaluate their own vs. others' ability may be somewhat different (e.g., Stipek & Tannatt, 1984). However, Meyer et al. (1979, Experiment 5), using a design similar to that in the present study, found that the role of feedback as a source of competence information was similar whether participants rated their own ability or that of others. Nevertheless, examining the role of feedback as a cue that children and adolescents use for determining *their own* level of ability should be an important research goal, given the achievement-related consequences associated with children's self-evaluations (Harter, 1998; Weiss & Ebbeck, 1996).

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Notes

¹ The tables of correlations were not included, given the large number of relationships examined. This information is available from the first author upon request.

² The effects sizes were calculated using the following equation from Thomas, Salazar, and Landers (1991): $ES = M_1 - M_2 / SD_{pooled}$. In this equation, M_1 and M_2 reflect the means of the two types of feedback being compared (evaluative vs. descriptive), and the SD_{pooled} reflects the pooled standard deviation of the two types of feedback.

³ Based on one reviewer's suggestions, we ran all analyses using the participants' self-reported knowledge of hitting a softball as an indicator of experience level instead of previous playing experience. Specifically, a medium split of self-reported knowledge was used to group the participants into high ($M = 4.28 \pm .46$) and low experience ($M = 2.71 \pm .59$) groups, and the series of $2 \times 2 \times 4$ (Age Group $\times$ Experience Level $\times$ Feedback Type) repeated-measures ANOVA were run again. The results of these analyses were essentially identical to those using playing experience as the indicator of experience. Most important, the hypothesized interactions did not emerge in any of the analyses using this alternative indicator of experience (all $p > .008$).

⁴ We would like to thank one of the reviewers for this suggestion.

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