

Predicting Sport Experience During Training: The Role of Change-Oriented Feedback in Athletes' Motivation, Self-Confidence and Needs Satisfaction Fluctuations

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Change-oriented feedback (COF) quality is predictive of between-athletes differences in their sport experience (Carpentier & Mageau, 2013). This study extends these findings by investigating how training-to-training variations in COF quality influence athletes' training experience (within-athlete differences) while controlling for the impact of promotion-oriented feedback (POF). In total, 49 athletes completed a diary after 15 consecutive training sessions to assess COF and POF received during training, as well as situational outcomes. Multivariate multilevel analyses showed that, when controlling for covariates, COF quality during a specific training session is positively linked to athletes' autonomous motivation, self-confidence and satisfaction of their psychological needs for autonomy and relatedness during the same session. In contrast, COF quantity is negatively linked to athletes' need for competence. POF quality is a significant positive predictor of athletes' self-confidence and needs for autonomy and competence. Contributions to the feedback and SDT literature, and for coaches' training, are discussed.

Keywords: feedback, coaching behaviors, autonomy support, self-determination theory, motivation

An athlete's career is made up of series of training sessions that differ from one another, and athletes' experiences greatly vary across trainings (Gagné, Ryan, & Bargmann, 2003). For coaches, each of these trainings constitutes an opportunity to influence their athletes' development. One of the ways in which coaches can shape their athletes' experience and behaviors is through the provision of feedback. In a recent study, Carpentier and Mageau (2013) showed that the provision of a high-quality change-oriented feedback (also referred to as *negative feedback*) predicts athletes' positive outcomes above and beyond other behaviors adopted by coaches. However, this study focused on the impact of coaches' behaviors on *between-athletes* differences such that differences across trainings within the same coach-athlete relationship (*within-athlete* differences) were not examined. The present study proposes to extend Carpentier and Mageau's (2013) findings by investigating how

training-to-training variations in feedback quality influence fluctuations in athletes' phenomenological experience during these trainings.

Change-Oriented Feedback

In the context of coach-athlete relationships, feedback is defined as information conveyed to athletes about the extent to which their behaviors/performance correspond to expectations (Cusella, 1987; Hein & Koka, 2007). While promotion-oriented feedback aims at confirming and promoting desirable behaviors, change-oriented feedback indicates that behaviors need to be modified to eventually achieve athletes' goals (Carpentier & Mageau, 2013). The study of optimal change-oriented feedback is crucial because change-oriented feedback has the potential to serve two important functions (Weinberg & Gould, 2011): it can motivate athletes by increasing their desire to perform better in the future, and it can guide athletes by helping them focus on the changes they need to implement if they wish to improve. Recent studies have shown that, as it is the case for numerous coaching behaviors (Mageau & Vallerand, 2003), change-oriented feedback must be autonomy supportive to lead to positive consequences (Carpentier & Mageau, 2013; Mouratidis, Lens, & Vansteenkiste, 2010).

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) showed that coaches can nourish their athletes' motivation and well-being by adopting behaviors that

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support the satisfaction of their need for autonomy (Fredrick & Ryan, 1995). The need for autonomy refers to the universal desire to feel that one is at the origin of one's actions and that one's actions are concordant with one's values (Deci & Ryan, 1985). In past research, autonomy support has been operationalized using these typical behaviors: providing choices to athletes within rules and limits and allowing opportunities to take initiatives, explaining the rationale behind demands, rules and expectations, and inquiring about and acknowledging athletes' feelings (Mageau & Vallerand, 2003). Coaches who adopt these autonomy-supportive behaviors have been shown to facilitate the satisfaction of autonomy but also the satisfaction of the two other fundamental psychological needs: the need for competence (i.e., desire to have an effect on the environment and to attain valued outcomes; Deci & Ryan, 2000) and the need for relatedness (i.e., desire to feel connected to others; Deci & Ryan, 2000). Furthermore, autonomy-supportive sport contexts have been linked to numerous other positive consequences for athletes such as higher self-esteem, autonomous motivation and well-being, longer persistence in sport and less burn-out and injuries (Amorose & Anderson-Butcher, 2007; Gagné et al., 2003; Pelletier, Fortier, Vallerand, & Brière, 2001; Quesed & Duda, 2010; Reinboth, Duda, & Ntoumanis, 2004; Smith, Ntoumanis, & Duda, 2007).

Autonomy-Supportive Change-Oriented Feedback

Recent studies on change-oriented feedback have shown that an autonomy-supportive change-oriented feedback could be added to coaches' autonomy-supportive behaviors repertoire (Carpentier & Mageau, 2013; Mouratidis et al., 2010). Carpentier and her colleagues (2013, 2016) showed that, to be autonomy-supportive, change-oriented feedback must be 1) empathic, 2) accompanied by choices of solutions to correct the problem, 3) based on clear and attainable objectives known to athletes, 4) free from person-related statements, 5) paired with tips, and 6) given in a considerate tone of voice. Together, these characteristics make feedback more empathic, descriptive (i.e., informational and neutral), and they leave room for athletes' active participation in decision making or problem-solving, which are the main ingredients of autonomy support (Deci, Eghrari, Patrick, & Leone, 1994; Grolnick & Ryan, 1989; Koestner, Ryan, Bernieri, & Holt, 1984; Ryan, 2005). Athletes who receive a more autonomy-supportive change-oriented feedback report higher levels of motivation, well-being, self-esteem, and satisfaction of their needs for autonomy, relatedness and competence, and experience less negative affect and amotivation (Carpentier & Mageau, 2013; Carpentier, Mageau, & Koestner, 2016; Mouratidis et al., 2010). Athletes' performance is also positively linked to receiving a more autonomy-supportive change-oriented feedback (Carpentier & Mageau, 2013).

Autonomy-supportive change-oriented feedback is nevertheless a complex construct. Part of its complexity

comes from the fact that it refers to autonomy-supportive behaviors that occur in the context of a structuring behavior (i.e., feedback provision). Structure refers to coaching behaviors aimed at organizing athletes' environment in a way that increases competence and predictability (Grolnick & Pomerantz, 2009; Jang, Reeve, & Deci, 2010). As it is the case for other elements of structure such as communicating expectations, setting limits, or giving rewards (Grolnick & Ryan, 1987; Jang et al., 2010; Koestner et al., 1984; Ryan, Mims, & Koestner, 1983), Carpentier and Mageau (2013) proposed that the *quantity* of change-oriented feedback may be conceptualized as a specific aspect of structure, while the way that change-oriented feedback is provided (i.e., its *quality*) refers to autonomy-supportive behaviors occurring in the context of feedback provision. Feedback quality thus determines whether it will be perceived as autonomy-supportive or controlling and ultimately whether it will have positive or negative repercussions. Carpentier and Mageau (2013) provided evidence that a change-oriented feedback characterized by the six aforementioned features is autonomy supportive by showing that more autonomy-supportive coaches are more likely to provide change-oriented feedback characterized by these features, and that such feedback is positively related to athletes' perceptions of autonomy. In addition, change-oriented feedback quality is not redundant with other autonomy-supportive behaviors but predicts athletes' outcomes above and beyond coaches' other autonomy-supportive behaviors.

Available research on change-oriented feedback quality either asked athletes to think about the change-oriented feedback they generally received from their coach and then related these perceptions to athletes' contextual well-being, motivation or needs satisfaction (Carpentier & Mageau, 2013; Mouratidis et al., 2010), or manipulated the type of feedback that athletes received (i.e., controlling or autonomy supportive) and then investigated the impact of this feedback on athletes' outcomes (Mouratidis et al., 2010). These studies thus focused on between-athletes differences and variations in the feedback that athletes receive across trainings or the impact of these fluctuations on athletes' situational experience have not yet been considered. Gagné and Blanchard (2007) noted that important information is lost when designs are cross-sectional. Specifically, these authors argued that athlete reports of their global sport experience or of their coach's typical behaviors do not represent accurate averages of what happened during various sessions because these self-reports depend on athletes' memory and their emotional state at the time of the study. In addition, Gagné and her colleagues (2003) showed that changes in athletes' well-being are more influenced by what occurred during specific training sessions than by athletes' general experience. Finally, coaching behaviors should vary from one training to the next because they have been shown to be influenced by situational factors (e.g., coach's stress level or motivation; Rocchi, Pelletier, & Couture, 2013; Taylor, Ntoumanis, & Smith, 2009). Given the fundamental role that feedback

plays within the coach-athlete relationship (Carpentier & Mageau, 2013), fluctuations in the quality of the change-oriented feedback that athletes receive should greatly impact their daily training experience. For these reasons, the current study evaluates training-to-training variations in change-oriented feedback quality and examines their relation with athletes' phenomenological experience during these trainings.

In addition to ignoring within-athlete variations, past studies have also omitted to control for the impact of promotion-oriented feedback when examining the impact of change-oriented feedback. It thus remains possible that the observed positive relations between change-oriented feedback quality and athletes' outcomes are due to the fact that coaches who give a high quality change-oriented feedback also provide a better promotion-oriented feedback.

Promotion-Oriented Feedback

Research has often highlighted the positive effect of promotion-oriented feedback.¹ Experimental designs first showed that receiving such feedback, compared with tangible rewards, no feedback or change-oriented feedback, results in increased intrinsic motivation (Deci, 1971, 1972). Deci (1972) suggested that the feeling of satisfaction that comes from promotion-oriented feedback may sometimes be attributed to the activity, resulting in an increase in the activity's positive properties (Koch, 1956) and consequently in intrinsic motivation. The positive impacts of receiving promotion-oriented feedback on intrinsic motivation and well-being have also been highlighted in the sport domain using self-reported measures (e.g., Amorose & Horn, 2000; Hollebeak & Amorose, 2005; Reinboth et al., 2004).

Although the positive link between promotion-oriented feedback and positive outcomes is intuitive, research has shown that promotion-oriented feedback is not systematically beneficial for the individual who receives it (see Deci, Koestner, & Ryan, 1999, for a review) and that to be positive it must be given in an autonomy-supportive way. Specifically, Ryan (1982) proposed that promotion-oriented feedback has two functional aspects: an informational (i.e., "you did well on this task") and a controlling (i.e., "you did well as I expected of you") aspect, and that the informational aspect must be salient to support the receiver's autonomy. When salient the informational aspect facilitates the integration of behavioral regulations by increasing the value and thus acceptance of requested behaviors (Deci & Ryan, 2000). The meta-analytical review by Deci et al. (1999) confirmed that although an informational promotion-oriented feedback enhances intrinsic motivation, a controlling one undermines it.

In the present research, autonomy-supportive promotion-oriented feedback is defined as an appreciative description of what coaches observe (e.g., "You noticed that your teammate freed himself and you made a nice pass!") or feel (e.g., "Such team work is a pleasure to

see!") during training. This definition is based on Ryan's (1982) work showing that an autonomy-supportive promotion-oriented feedback is informational. It is also derived from Ginott's (1965) proposition that an autonomy-supportive promotion-oriented feedback should be descriptive instead of evaluative. In Ginott's (1965) writings, which first inspired the SDT definition of autonomy support, it is suggested that promotion-oriented feedback should focus on describing what has been done properly instead of just praising receivers. This description in turn enables receivers to evaluate their own accomplishments positively and then praise themselves. The fact that the praise comes from the receivers themselves makes them less dependent on external approval and prevents more controlled forms of motivation (i.e., to be praised, not to disappoint; Assor, Roth, & Deci, 2004; Ryan & Deci, 2002).

Despite the importance of coaches' feedback, no research has investigated its impact on athletes' sport experience while assessing its focus (promotion-oriented or change-oriented), its quality (i.e., the extent to which it is autonomy supportive) and its quantity (i.e., frequency without specifying quality). The present study makes these distinctions to examine the impact of feedback on athletes' sport experience across trainings.

The Present Study

A diary design was used to record athletes' training-to-training perceptions of the change-oriented and promotion-oriented feedback they receive as well as athletes' situational outcomes. We focused on situational levels of motivation, self-confidence and satisfaction of their needs for autonomy, competence and relatedness because coaches' behaviors (e.g., Amorose, 2007; Reinboth et al., 2004), and more specifically coaches' feedback (Carpentier & Mageau, 2013; Mouratidis et al., 2010), have been shown to predict needs satisfaction, motivation and self-esteem at the contextual level. Needs satisfaction, motivation and well-being have also been shown to vary on a daily basis (Gagné et al., 2003). In this study and given the informational value of feedback regarding athletes' competence and future chance of success, self-confidence was preferred over self-esteem or well-being variables because it was expected to be a more proximal situational outcome of feedback.

Based on Carpentier and Mageau's (2013) findings on the relative impact of change-oriented feedback quality and quantity at the between-athletes level, it was postulated that athletes' training-to-training experience would depend more on the quality of feedback received during training than on its quantity. Thus, it was expected that the more athletes would receive autonomy-supportive change-oriented and promotion-oriented feedback during a specific training session compared with what they usually receive, the more they would report high levels of autonomous motivation (i.e., engaging in their sport with a sense of willingness, Deci & Ryan, 1985),

self-confidence and satisfaction of their basic psychological needs for that same session. The reverse finding was expected for levels of controlled motivation (i.e., practicing their sport with a sense of external or internal pressure, Deci & Ryan, 1985). These results should be observed even when controlling for the impact of change-oriented and promotion-oriented feedback quantity. Finally, it was expected that the impact of feedback quality would influence athletes' experience even when controlling for athletes' perception of their coach's general autonomy-supportive style (i.e., the extent to which he/she generally adopts autonomy-supportive behaviors that are not feedback-related).

Method

Participants

The sample was composed of 49 athletes participating in five different sports, namely, synchronized swimming (69%), swimming (25%), track and field (2%), handball (2%) or soccer (2%). Athletes were either competing in individual (13%), team (27%) or both types of events (60%). They were aged between 10 and 24 years old ($M = 14.65$, $SD = 2.56$) and were mainly female (94%). At the time of the study, they were training 11.71 hr per week on average ($SD = 3.88$), had been practicing their sport for an average of 5.79 years ($SD = 2.40$), and were competing at the regional (13%), provincial (77%), national (6%) or international (4%) level. Finally, they had been with their coach for an average of 25 months.

All athletes were French Canadians. As recommended by Vallerand (1989), a parallel back-translation procedure was used to translate scales to French. This procedure requires that a bilingual person translates the original items from English to French. The newly created version is then translated back to English by another bilingual person, creating a second English version of the scale. The original and translated English versions are then compared with ensure that each item's meaning has been maintained through the translations. As a final step, a committee of experts assesses the final French version of the scale to ensure face validity in the French Canadian culture.

Procedure

Athletes were recruited through their coaches, by contacting provincial federations. This recruitment procedure was chosen because our research protocol required athletes to complete assessments at the end of multiple training sessions, which necessitated coaches' collaboration. Federations first sent emails to their coaches inviting them to contact the researchers if they were interested in the project. Interested coaches introduced the first author to their athletes during a meeting where she presented the project. Athletes who agreed to participate filled out an initial questionnaire after a first training session, which assessed their perception of their coach's general

autonomy-supportive style as well as demographic variables. They then completed a short diary immediately after their next 15 training sessions. The number of diaries completed per athlete varied between 5 and 15 ($M = 10.90$), for a total of 534 completed diaries. Each diary included athletes' reports of the change-oriented and promotion-oriented feedback they received during the specific training session that just ended, as well as situational measures of their phenomenological experience. Measures used in athletes' initial and situational questionnaires are briefly described in the next section. Details regarding each scale (number of items, sample item, response scale and Cronbach's alpha) are presented in Table 1.

Athletes' Initial Questionnaire

Perceived General Autonomy-Supportive Style. A French adaptation for the sport setting (*Échelle des Perceptions du Soutien à l'Autonomie en Sport*; Gillet, Vallerand, Paty, Gobancé, & Berjot, 2010) of the Perceived Autonomy Support Scale for Exercise Settings (PASSES; Hagger et al., 2007) was used to evaluate the extent to which athletes perceive their coach to be generally autonomy supportive using behaviors such as providing choice, offering a rationale and acknowledging feelings. This scale originally comprises 12 items. One item was removed for the current study because it concerns the provision of promotion-oriented feedback. This ensured that only autonomy-supportive behaviors that are not feedback-related were assessed.

Athletes' Diary

Change-Oriented Feedback Quality. Quality was evaluated using six items, each one representing a characteristic of an autonomy-supportive change-oriented feedback. These items come from the Quality of Change-Oriented Feedback Scale (Carpentier & Mageau, 2013) and were chosen based on their factor loadings in Carpentier and Mageau's (2013) study. Only items with the highest loading on their respective factor (ranging from .68 to .94) were retained. Chosen items were then adapted to capture the situational aspect of feedback quality. For example, the item "When my coach is not satisfied with my performance, he gives me tips so that I can improve in the future" was modified to "During today's training, when my coach told me that he was not satisfied with my performance, he also gave me tips so that I could improve."

Promotion-Oriented Feedback Quality. A high quality promotion-oriented feedback was conceptualized as being descriptive (Ginott, 1965). A single item assessed this characteristic.

Change-Oriented and Promotion-Oriented Feedback Quantity. The quantity of change-oriented and promotion-oriented feedback received by athletes during a specific training session were also assessed using a single item each.

Table 1 Details of Measures Used in Athletes' Initial and Situational Questionnaires

Construct	Number of Items	Sample Item	Response Scale Minimum	Response Scale Maximum	α
Initial Questionnaire					
1. General Autonomy-Supportive Style	11	"My coach makes sure I understand why I need to do this sport activity"	"Do not agree at all" (1)	"Very strongly agree" (7)	.87
Diary					
1. Quality of Change-Oriented Feedback	6	"During today's training, when my coach told me that he was not satisfied with my performance, I felt he was still aware of the efforts I had made"	"Never" (1)	"Always" (7)	.80
2. Quantity of Change-Oriented Feedback	1	"During today's training, my coach gave me negative feedback"	"Not at all" (1)	"A lot" (7)	—
3. Quality of Promotion-Oriented Feedback	1	"During today's training, when my coach told me that he was satisfied with my performance, he took the time to describe the specific things that I had done well"	"Never" (1)	"Always" (7)	—
4. Quantity of Promotion-Oriented Feedback	1	"During today's training, my coach gave me positive feedback"	"Not at all" (1)	"A lot" (7)	—
5. Autonomous and Controlled Motivation					
Intrinsic motivation	1	"Today, I practiced my sport because it is fun"	"Does not correspond at all" (1)	"Corresponds exactly" (7)	—
Identified regulations	1	"Today, I practiced my sport because I think it is good for me"	"Does not correspond at all" (1)	"Corresponds exactly" (7)	—
Introjected regulations	1	"Today, I practiced my sport because I would feel guilty for not doing it"	"Does not correspond at all" (1)	"Corresponds exactly" (7)	—
External regulations	1	"Today, I practiced my sport because it is something that I have to do"	"Does not correspond at all" (1)	"Corresponds exactly" (7)	—
6. Self-Confidence	5	"I was confident about performing well"	"Not at all" (1)	"Very much so" (4)	.87
7. Basic Psychological Needs Satisfaction					
Autonomy	3	"During today's training, I could express my feelings and opinions"	"Do not agree at all" (1)	"Very strongly agree" (7)	.80
Competence	3	"During today's training, I felt competent"	"Do not agree at all" (1)	"Very strongly agree" (7)	.91
Relatedness	3	"During today's training, I got along well with people around me"	"Do not agree at all" (1)	"Very strongly agree" (7)	.89

Autonomous and Controlled Situational Motivation.

SDT has shown that behavioral regulations differ in the extent to which they are self-determined. Four types² of behavioral regulations have been proposed: two forms of autonomous motivation, intrinsic and identified motivation, and two types of controlled regulations, introjected and external regulations (Deci & Ryan, 1985). Items from a sport-adapted version (Gillet, Vallerand, Amoura, & Baldes, 2010) of the Situational Motivation Scale (SIMS; Guay, Vallerand, & Blanchard, 2000) were used to assess athletes' situational motivation. This adapted version of the SIMS assesses the four types of motivation toward a specific task using four-item subscales. To keep athletes' diary as short as possible, one item per subscale was included in the questionnaire. These items were selected based on a factor analysis performed on a separate database (Gillet, Vallerand, Lafreniere, & Bureau, 2013). Autonomous motivation was assessed using the average of intrinsic and identified motivation scores (Ryan & Deci, 2000), while a controlled motivation score was obtained by averaging the introjected and external regulations. Both intrinsic and identified types of motivation are needed to evaluate autonomous motivation because by nature not all tasks can be intrinsically motivating. To be autonomously motivated in situations where behaviors are not themselves rewarding, athletes must rely on identified regulations where the importance of the activity has been internalized (i.e., because it reflects one's values and beliefs). Similarly, both introjected and external regulations represent forms of motivation that have not been fully internalized. Controlled motivation can thus come from internal forms of control (e.g., shame, guilt, etc.) or from external contingencies (e.g., punishments or rewards). The high correlations between intrinsic and identified motivation ($r = .42$) and between introjected and external regulations ($r = .61$) support the underlying constructs of autonomous and controlled motivations.

Self-Confidence. The self-confidence subscale of the Revised Competitive State Anxiety-2 (Cox, Martens, & Russell, 2003) was used to assess athletes' situational level of self-confidence following their training session.

Basic Psychological Needs Satisfaction. Experiences of autonomy, competence and relatedness during the training session were assessed using an adapted version of the Basic Psychological Needs Satisfaction in a Sport Context Scale (Gillet, Rosnet, & Vallerand, 2008). This scale assesses the extent to which the sport context generally allows the satisfaction of athletes' needs. Although the original scale comprises 15 items, only 9 items were adapted to the situational context to keep the diaries as short as possible. Items that could best capture needs satisfaction during training, while requiring the least modifications, were kept.

Data Analysis

The present study involves a hierarchically structured data set with two levels of generality. The first *within-athlete*

level represents fluctuations in athletes' perceptions of the feedback they receive across trainings as well as their phenomenological experience during these trainings. The second level represents variables that vary *between-athletes*, such as athletes' perception of their coach's general autonomy-supportive style. Multivariate multi-level analyses were performed in MPlus 7.3 (Muthén & Muthén, 1998–2012) using MLR to handle missing data and multivariate non-normality (Yuan & Bentler, 2000). Multivariate multilevel analyses were used because they consider the hierarchical structure of the data and take into account the correlations among the dependent variables (Entink, Fox, & van der Linden, 2009; Goldstein, Carpenter, Kenward, & Levin, 2009). While traditional regression techniques would treat the various training observations as independent from one another, which could result in an underestimation of the standard errors of regression coefficients, multivariate multilevel analyses compute relationships between Level-1 variables (i.e., training-level variables) independently for each Level-2 unit (i.e., each athlete), with an intercept and a slope per athlete for each outcome. Thus, these analyses can examine the impact of change-oriented and promotion-oriented feedback quality and quantity received during training on the different situational outcomes simultaneously for each athlete. For each dependent variable, a grand mean representing the averaged intercepts of each athlete and grand slopes representing the averaged slopes of each predictor for each athlete are obtained. It is then possible to (1) estimate the variability of each athlete's mean and slopes around the grand mean and the grand slopes, and (2) predict the variability of means and slopes from Level-2 predictors simultaneously for each outcome.

During multivariate multilevel analyses, all Level-1 predictors were centered on the athlete's mean while Level-2 predictors were centered on the sample's mean. Thus, for Level-1 predictors, slopes indicate the impact of receiving more or less change-oriented and promotion-oriented feedback than usual (i.e., compared with other trainings), and of receiving feedback of greater or poorer quality than usual, on the various outcomes for each athlete. Regarding the Level-2 predictor, namely coaches' general autonomy-supportive style, slopes represent the impact of perceiving one's coach as more or less autonomy supportive than other athletes' perceptions of their coach on the various outcomes. Finally, when specifying models, effects were assumed to vary randomly across athletes. A significant random effect would indicate that these effects are not homogeneous across athletes.

Results

Descriptive Statistics

All variables were normally distributed, as indicated by skewness and kurtosis scores ranging from -1.53 to 2.44 , which is between the recommended range of -3 to 3 (Kline, 1998). Descriptive statistics and correlations among variables are presented in Table 2.

Table 2 Descriptive Statistics and Correlations Among Variables

Variables	Correlations											
	1	2	3	4	5	6	7	8	9	10	11	
Athletes' Measures (Level 2)												
1 General Autonomy-Supportive Style	—	.31	-.13	.20	.26	.36	-.07	.05	.12	.31	.24	
Intra-Athlete's Measures (Level 1)												
2 Change-Oriented Feedback Quality		—	-.41	.46	.51	.35	.02	.34	.41	.46	.43	
3 Change-Oriented Feedback Quantity			—	-.16	-.35	-.23	.02	-.20	-.21	-.14	-.27	
4 Promotion-Oriented Feedback Quality				—	.46	.25	.00	.30	.32	.23	.37	
5 Promotion-Oriented Feedback Quantity					—	.25	-.01	.23	.22	.17	.29	
6 Autonomous Motivation						—	.03	.39	.46	.41	.55	
7 Controlled Motivation							—	-.03	.03	.05	.01	
8 Self-Confidence								—	.33	.28	.62	
9 Autonomy									—	.46	.43	
10 Relatedness										—	.36	
11 Competence											—	
	<i>N</i>	48	527	497	528	497	533	533	530	533	533	533
	<i>M</i>	6.09	5.69	2.89	4.86	4.59	5.88	4.06	2.99	5.10	6.12	5.38
	<i>SD</i>	0.69	1.04	1.72	1.87	1.69	1.22	1.95	0.76	1.47	1.05	1.34

Note. Significance levels for the correlations among variables in multilevel models are not available in MPlus.

Table 3 Fixed Effects of the Multivariate Multilevel Models Predicting Situational Autonomous and Controlled Motivation, Self-Confidence and Satisfaction of the Needs for Autonomy, Relatedness and Competence From Change-Oriented and Promotion-Oriented Feedback (Level 1) and Coaches' Autonomy-Supportive Style (Level 2)

Parameters	Autonomous Motivation	Controlled Motivation	Self-Confidence	Autonomy	Relatedness	Competence	
<i>Fixed Effects</i>							
<i>Grand Mean</i>							
Initial Status	γ_{00} (SE)	5.84*** (.13)	3.94*** (.24)	3.00*** (.08)	5.10*** (.16)	6.06*** (.11)	5.36*** (.12)
<i>Predicting Mean</i>							
General Autonomy-Supportive Style	γ_{01} (SE)	.46* (.23)	-.18 (.33)	.01 (.11)	.17 (.24)	.29 (.20)	.24 (.18)
<i>Grand Slopes</i>							
Change-oriented feedback quality	γ_{10} (SE)	.25* (.11)	.06 (.10)	.14* (.06)	.42** (.14)	.31*** (.08)	.24 (.16)
Change-oriented feedback quantity	γ_{20} (SE)	-.09 (.06)	.03 (.07)	-.05 (.03)	-.09 (.05)	-.01 (.04)	-.19** (.07)
Promotion-oriented feedback quality	γ_{30} (SE)	.07 (.04)	-.02 (.08)	.12*** (.02)	.15* (.06)	.06 (.04)	.24*** (.07)
Promotion-oriented feedback quantity	γ_{40} (SE)	.02 (.03)	-.01 (.04)	.00 (.03)	-.05 (.07)	-.01 (.03)	.04 (.05)
<i>Intraclass Correlations (proportion of variance at the between-athletes level)</i>							
		.59	.73	.48	.55	.46	.33

* $p < .05$; ** $p < .01$; *** $p < .001$.

Main Analyses

To test our hypotheses, multivariate multilevel analyses were conducted for each of our areas of interest, namely athletes' motivation, self-confidence and needs satisfaction. Results of each model are presented in Table 3. Intraclass correlations (ICC) are also presented in Table 3. These represent the proportion of variance that lays between athletes for each outcome, whereas 1-ICC represent the proportion of within-athlete variance.

Situational Impact of Feedback on Athletes' Motivation. The impact of change-oriented feedback quality and quantity received during training on athletes' situational autonomous and controlled motivation was first examined, while controlling for the impact of promotion-oriented feedback received during training and for coaches' general autonomy-supportive style. The quality and quantity of change-oriented feedback received during training were entered as within-athlete (Level-1) predictors of outcomes. The quality and quantity of the promotion-oriented feedback received during training were also included in the model as Level-1 predictors to control for their respective effects. Finally, athletes' perception of their coach's general autonomy-supportive style was entered as a Level-2 control variable when predicting means.

As predicted, when the quality and quantity of change-oriented and promotion-oriented feedback were entered alongside coaches' autonomy-supportive style to predict athletes' autonomous and controlled motivation, the quality of change-oriented feedback was a significant predictor of athletes' autonomous motivation ($\gamma = .25, p < .05$). Thus, the more athletes received an autonomy-supportive change-oriented feedback during training sessions compared with what they usually received, the more they reported high levels of autonomous motivation following these training sessions. Change-oriented feedback quantity ($p = .15$) as well as promotion-oriented feedback quantity ($p = .50$) and quality ($p = .10$) had no effect on athletes' situational autonomous motivation. Coaches' autonomy-supportive style had a significant positive impact on athletes' mean level of autonomous motivation ($\gamma = .46, p < .05$). Thus, the more an athlete perceived his/her coach as generally autonomy supportive compared with other athletes' perceptions of their coaches, the more they reported high levels of situational autonomous motivation. Entering quality and quantity of change-oriented and promotion-oriented feedback as Level-1 predictors explained 10.12% of the within-athlete variability on autonomous motivation while coaches' autonomy-supportive style explained 9.88% of the outcome's between-athletes variability.

Change-oriented feedback quality was not linked to athletes' controlled motivation ($p = .55$), which was contrary to expectations. In addition, none of the other Level-1 variables had a significant effect on athletes' controlled motivation (see Table 3). Similarly, coaches' general autonomy-supportive style did not predict athletes' mean level of situational controlled motivation ($p = .59$).

Situational Impact of Feedback on Athletes' Self-confidence. The impact of the quality and quantity of change-oriented feedback received during training on athletes' situational level of self-confidence was also investigated while controlling for promotion-oriented feedback quality and quantity received during training and for coaches' general autonomy-supportive style. Results indicated that change-oriented and promotion-oriented feedback quality were the only significant predictors of athletes' self-confidence across trainings. The more athletes received an autonomy-supportive change-oriented ($\gamma = .14, p < .05$) and promotion-oriented ($\gamma = .12, p < .001$) feedback during a training session compared with what they usually received, the more they reported high levels of self-confidence during this training. Change-oriented ($p = .10$) and promotion-oriented ($p = .89$) feedback quantity were not linked to athletes' situational level of self-confidence, nor was coaches' general autonomy-supportive style ($p = .93$). Change-oriented and promotion-oriented feedback quality and quantity explained 17.14% of the within-athlete variability on self-confidence.

Situational Impact of Feedback on Athletes' Needs Satisfaction. The impact of change-oriented feedback received during training on athletes' situational satisfaction of their basic psychological needs for autonomy, relatedness and competence was also investigated. Once again, the impact of change-oriented feedback was studied while controlling for the impact of promotion-oriented feedback quality and quantity and for coaches' general autonomy-supportive style. As expected, change-oriented feedback quality was a significant predictor of variations in athletes' satisfaction of their need for autonomy across trainings. Athletes receiving a more autonomy-supportive change-oriented feedback during a training session compared with the one they usually received reported a greater satisfaction of their need for autonomy during this training ($\gamma = .42, p < .01$). Promotion-oriented feedback quality was also significantly linked to athletes' situational satisfaction of their need for autonomy, with athletes reporting receiving a more autonomy-supportive promotion-oriented feedback also experiencing higher levels of satisfaction of their need for autonomy ($\gamma = .15, p < .05$). Change-oriented ($p = .06$) and promotion-oriented ($p = .46$) feedback quantity, as well as coaches' general autonomy-supportive style ($p = .48$), were not significantly linked to perceptions of autonomy.

There was also a significant link between change-oriented feedback quality and athletes' situational satisfaction of their need for relatedness. Thus, the more athletes received an autonomy-supportive change-oriented feedback during a training session compared with what they usually received, the more their need for relatedness was satisfied during this training ($\gamma = .31, p < .001$). However, contrary to our expectations, promotion-oriented feedback quality was not linked to athletes' perceptions of relatedness ($p = .20$). Results pertaining to other Level-1 and Level-2 predictors entered in our model were also nonsignificant (see Table 3).

Finally and contrary to our expectations, the quality of the change-oriented feedback received during a training session was not significantly linked to perceptions of competence during this same training session ($p = .14$). However and as predicted, promotion-oriented feedback quality did have a significant and positive impact on athletes' perceptions of competence. The more athletes received an autonomy-supportive promotion-oriented feedback ($\gamma = .24, p < .001$) during a training session compared with what they usually received, the more they felt competent during this same training. Meanwhile, change-oriented feedback quantity was negatively linked to athletes' perceptions of competence: The more athletes received change-oriented feedback, the less they felt competent during this training ($\gamma = -.19, p < .01$). Finally, promotion-oriented feedback quantity ($p = .46$) and coaches' general autonomy-supportive style ($p = .18$) were not significant predictors of athletes' perceptions of competence.

Change-oriented and promotion-oriented feedback quality and quantity explained 20.58%, 11.06% and 23.90% of the within-athlete variability in satisfaction of the needs for autonomy, relatedness and competence respectively.

Discussion

The present study shows that the quality of change-oriented feedback athletes receive during specific trainings is determinant for their experience during these trainings. The more athletes receive a change-oriented feedback that is autonomy supportive compared with what they usually receive, the more they experience autonomous motivation, self-confidence and satisfaction of their basic psychological needs for autonomy and relatedness. The quality of promotion-oriented feedback is also a significant positive predictor of athletes' self-confidence and perceptions of autonomy and competence.

In addition to these postulated relations between change-oriented feedback quality and athletes' outcomes, unexpected results also emerged. First, no relation was found between change-oriented feedback quality (or any other assessed predictors) and controlled motivation. It should be noted that controlled motivation was the only negative consequence evaluated in this study and that the variance components of the unconditional models suggest that this variable had somewhat less within-athlete variability (27.51%) than the other outcomes (41.30% and above; see Table 3). It is possible that positive outcomes are more reactive to daily variations in coaches' behaviors than negative ones, which may require repeated exposure to negative behaviors to vary. If this hypothesis holds, it may be preferable to look at the impact of several successive training sessions in which coaches would have adopted more negative behaviors, such as in periods of high stress. Future studies are thus needed to further explore the situational impact of coaches' behaviors on various negative outcomes and using different time frames.

Second, athletes' situational perceptions of competence seem to be more affected by variations in change-oriented feedback quantity and promotion-oriented feedback quality than by fluctuations in change-oriented feedback quality, which was not the case for the other outcomes. These findings stand in contrast with past research showing that change-oriented feedback quality, and not quantity, was positively linked to athletes' perceptions of competence at the between-athletes level (Carpentier & Mageau, 2013). It may be that over time receiving high quality change-oriented feedback provides athletes with the opportunities they need to develop their competence, thereby increasing their perceptions of this competence. However, at the situational level, receiving a lot of change-oriented feedback may inform athletes that high competence has not yet been achieved, even when change-oriented feedback is given in a more autonomy-supportive way. From this, one may suggest that providing change-oriented feedback negatively affects athletes' perceptions of competence during training, regardless of the quality of the feedback, but that over time providing this type of feedback in a more autonomy-supportive way helps athletes focus on competence development and feel more competent than athletes who receive less autonomy-supportive feedback. This hypothesis would be concordant with past results showing that change-oriented feedback quality is a positive predictor of athletes' progression during the training season (Carpentier & Mageau, 2013). In contrast, the quality of promotion-oriented feedback is more important than its quantity when predicting athletes' perceptions of competence. Results thus suggest that to increase athletes' feelings of competence coaches should favor a descriptive promotion-oriented feedback over an evaluative one. Indeed, being told that one is competent seems less convincing for one's competence beliefs than being provided with the information needed to evaluate oneself as competent.

Third, results showed that the quality of promotion-oriented feedback was not related to athletes' need for relatedness. This finding suggests that providing a more descriptive promotion-oriented feedback may represent a neutral way for coaches to increase athletes' perceptions of competence, that is, without improving or compromising the coach-athlete relationship. This type of feedback may also be less likely to make athletes overly dependent on their coach for deriving their own self-worth because it encourages athletes to focus on objective cues to evaluate their competence instead of on their coach's approval. Future research should test the proposed linkage between different types of promotion-oriented feedback (i.e., descriptive vs. evaluative) and various self-esteem contingencies (i.e., based on others' approval vs. based on one's accomplishments; Crocker & Wolfe, 2001).

Finally, autonomy-supportive promotion-oriented feedback was expected to be positively associated with autonomous motivation and negatively linked to controlled motivation because this type of feedback should increase the intrinsic value of the activity as well as its

importance. Yet, these relations were not observed and no plausible explanation could be formulated for these unexpected nonsignificant results. Future research should further explore the relations among these variables.

Overall and despite these few unexpected findings, results suggest that feedback quality is more predictive of athletes' outcomes than its quantity and that it is consistently related to positive outcomes. The present study is the first to investigate the impact of feedback on athletes' outcomes while distinguishing the focus of the feedback (promotion-oriented or change-oriented), its quality (i.e., the extent to which it is autonomy supportive) and its quantity (i.e., frequency without specifying quality). The distinction between feedback quantity and quality is important as it increases predictive power. In addition, by partitioning the quantity of feedback (i.e., its structuring component) from the way that feedback is given (i.e., its autonomy-supportive component), this research contributes to the definition of autonomy support in situations of feedback provision. More autonomy-supportive coaches provide change-oriented feedback that is more empathic, paired with tips and choices of solutions, given in a considerate tone of voice, free from person-related statements and based on clear and attainable objectives known to athletes, and these autonomy-supportive characteristics are related to athletes' heightened autonomy perceptions in general (Carpentier & Mageau, 2013) and during training (this study). This line of research offers additional support to the recent proposition that structure may constitute the foundation for other behavioral dimensions to be communicated (Curran, Hill, & Niemic, 2013; Reeve, 2009; Smith et al., 2015). Considering that being autonomy supportive might be particularly challenging in situations that require a high degree of structure, identifying the characteristics that make structuring behaviors more autonomy supportive is crucial to facilitate the implementation of this positive interpersonal style.

The present study also contributes to the feedback literature by showing that change-oriented feedback influences athletes' outcomes above and beyond promotion-oriented feedback. These results assert that the positive links between change-oriented feedback quality and athletes' outcomes cannot be explained by the fact that coaches who give a better change-oriented feedback also give a better promotion-oriented feedback, even though these two behaviors are strongly correlated (see Table 2). This study thus highlights that, although promotion-oriented feedback is more pleasant to give than change-oriented feedback, avoiding the latter deprives athletes from its numerous potential positive consequences. Coaches would thus benefit from learning how to give a change-oriented feedback of high quality, which would prevent them from focusing solely on the provision of promotion-oriented feedback.

As an additional contribution, this study highlights a coaching behavior that influences athletes' experience from one training to the next. Past studies have shown that athletes' motivation, well-being and needs satisfaction

vary across trainings (Gagné et al., 2003). Yet, studies interested in the impact of the provision of an autonomy-supportive feedback had only investigated its impact at the between-athletes level (Carpentier & Mageau, 2013; Mouratidis et al., 2010), thereby ignoring daily variations. Variance components suggest that almost 50% of the variability of the quality of change-oriented feedback lies at the within-athlete level. The way coaches provide feedback thus changes across athletes but it also varies from one training to the next for each athlete. By showing that variations in training-specific change-oriented feedback quality are determinant for athletes' experience during these trainings, this study suggests that coaches may help athletes come out of training more autonomously motivated, confident, and related than during previous trainings. The importance of focusing future investigation on the situational factors that influence athletes' training experience is thereby underlined.

This research also contributes to the literature on SDT by providing further support for Ryan's (1982) original proposition that promotion-oriented feedback is not always beneficial. By showing that it is the quality of promotion-oriented feedback, and not its quantity, that predicts athletes' daily positive experience, the current study demonstrates that to facilitate self-confidence, autonomy and competence promotion-oriented feedback must be given in an autonomy-supportive way. In addition, the fact that receiving a descriptive promotion-oriented feedback was positively linked to athletes' perceptions of autonomy suggests that such feedback contributes to supporting athletes' autonomy. Thus, describing what has been done well is one of the ways in which coaches can make promotion-oriented feedback more autonomy-supportive. It is important to note however that coaches who have a more autonomy-supportive style do not seem to provide more descriptive feedback than more controlling coaches (see Table 2). In addition, promotion-oriented feedback quality was measured with a single item, which may have reduced its predictive power. Further work is thus required to refine the operationalization of an autonomy-supportive promotion-oriented feedback.

Although the current study contributes to the feedback, coaching behaviors and SDT literature, some limitations are worth mentioning. First, the correlational design used in this study makes causality inferences impossible. For example, one may argue that motivation does not improve because of the quality of the change-oriented feedback that athletes receive, but that it is coaches that are more likely to give a better feedback on days when they perceive athletes as more autonomously motivated. However, research on the determinants of change-oriented feedback has recently showed that coaches' perceptions of their athletes' motivation affect the quantity of their change-oriented feedback but not its quality (Carpentier & Mageau, 2014). Empirical evidence thus presently suggests that it is the quality of change-oriented feedback that influences athletes' motivation during a training session rather than the opposite. Yet,

to establish causality, future studies should manipulate change-oriented feedback in a laboratory setting.

Second, to keep the diaries as short as possible, some constructs were measured using a single item. Despite the fact that single-item scales have been used effectively in numerous studies (e.g., Robins, Hendin, & Trzesniewski, 2001; Schimmack & Oishi, 2005), other authors have argued that broad psychological constructs might be hard to capture using a single item (e.g., Crocker & Algina, 1986). In addition, items assessing change-oriented feedback quality and athletes' situational motivation were chosen based on their factor loadings in previous studies (Carpentier & Mageau, 2013; Gillet et al., 2013). Although each selected item had high face validity, one cannot be sure that the best item was used for each construct. Indeed, factor loadings are sample-specific and they may fluctuate between studies. In addition, because items assessing change-oriented feedback quality were originally validated at the contextual level, selected items might not be optimal to capture variations in situational change-oriented feedback quality. Yet, the fact that the present results are in line with our hypotheses and previous research (Carpentier & Mageau, 2013; Deci et al., 1999; Mouratidis et al., 2010; Ryan, 1982) suggests that they accurately reflect the relations among the studied variables. There is nevertheless a growing need for the development and validation of short situational measures to assess psychological constructs in diary studies.

Third, the composition of our sample limits the generalizability of our results. Indeed, synchronized swimmers constituted a large part of our sample and the majority of our athletes were consequently women. Although past research has shown that female athletes tend to report lower levels of intrinsic motivation and of satisfaction of their needs for competence and autonomy (e.g., Amorose & Horn, 2000; Carpentier & Mageau, 2013; Mouratidis et al., 2010), it has also been shown that gender does not moderate the impact of change-oriented feedback (Carpentier & Mageau, 2013). However, past research suggests that females might benefit less from receiving promotion-oriented feedback than males (Deci, 1972). It is thus possible that relations between promotion-oriented feedback and athletes' outcomes were reduced by the preponderance of women in our sample. Unfortunately, gender effects could not be tested because women were overrepresented in our sample (94%). Results of the current study should thus be replicated with a larger sample of male athletes, as well as in various sports, to have a more complete picture of the situational impact of feedback on athletes' experience.

In addition, although our sample was homogeneous in terms of sport and gender, it was heterogeneous with regard to athletes' age and competing level. However, these two variables were not correlated with the observed outcomes and adding them to the main analyses did not alter the obtained findings. Results were thus presented without these variables for the sake of parsimony. Furthermore, moderating effects of these variables could not be investigated in the present research as multivariate

multilevel analyses require a larger sample size to test such complex models. Yet, investigating potential moderators of the impact of feedback on athletes' experience should constitute a promising research avenue. For instance, it is possible that athletes react differently to the feedback they receive depending on their age, competing level or training phase (e.g., preparatory vs. competition phase). In addition, based on past research on the impact of rewards that showed that the interpersonal context in which they are administered can moderate their impact (Ryan et al., 1983), it is also possible that coaches' general autonomy-supportive style influences how the quality of the feedback received during a specific training relates to athletes' experience during this training. It may be that any feedback occurring in a generally autonomy-supportive climate is associated with more positive outcomes. Again, the moderating impact of coaches' general autonomy-supportive style on the impact of change-oriented and promotion-oriented feedback on training-to-training athletes' experiences could not be adequately tested because of the sample size. The potentially moderating role of age, level of competition, training phase, and coaches' general autonomy-supportive style thus remains to be investigated using a larger sample.

Finally, other outcomes could have been investigated, such as more general well-being indicators (e.g., positive affect, subjective vitality, etc.), anxiety or performance. Demonstrating a link between change-oriented feedback during training and subsequent performance should be particularly compelling for coaches considering that, in most sport events, medals are awarded based on an athlete's performance on a specific day. It is thus crucial for coaches to be aware of behaviors that maximize athletes' chances of performing at their best at the exact moment when it is required. Available evidence suggests that the more coaches tend to provide an autonomy-supportive change-oriented feedback, the more athletes improve over the training season, as perceived by coaches (Carpentier & Mageau, 2013). In the current study, performance was not investigated because we focused on athletes' experience during training and objective performance criteria were not available. In addition, coaches were not asked to complete performance diaries for each of their athletes because this procedure could have limited sample size. Future diary studies should thus focus on performance variations across competition and test the potential link between change-oriented feedback and objective measures of performance.

Despite its limitations, the current study has important practical implications. First, change-oriented feedback quality is positively linked to most of the assessed positive consequences (i.e., autonomous motivation, self-confidence and perceptions of autonomy and relatedness), suggesting that an autonomy-supportive change-oriented feedback is beneficial for athletes' situational experience. However, results pertaining to quantity are not as clear. On one hand, quantity is negatively linked to satisfaction of the need for competence during training. On the other hand, these effects do not seem to be long lasting as results obtained at the between-athletes level in past studies have

not found this negative link (Carpentier & Mageau, 2013; Mouratidis et al., 2010). Given these results, it seems reasonable to suggest that coaches need to keep in mind that change-oriented feedback has a potentially negative impact on athletes' perceptions of competence but that athletes do benefit from receiving high quality change-oriented feedback. Coaches are thus advised to limit the number of superfluous feedback but to give it when it is needed. Most importantly, the present research suggests that coaches should ensure that this feedback is given in an autonomy-supportive manner to enhance its positive outcomes. For promotion-oriented feedback, its quantity is not linked to outcomes above and beyond its quality. Yet, promotion-oriented feedback quality is positively linked to athletes' self-confidence and satisfaction of their needs for autonomy and competence. This suggests that, as long as coaches pay attention to the way they give promotion-oriented feedback, they do not have to worry about how many times they provide such feedback.

In conclusion, expectations toward coaches have become increasingly high as a result of scientific advancement in the sport domain. We expect them to be great technicians, efficient physical trainers, smart tacticians and inspiring motivators. To assist them in these multiple roles, research should aim at contributing practical knowledge that can easily be used by coaches on a daily basis. By identifying the type of feedback that contributes to more positive day-to-day psychological experiences for athletes, this study should empower coaches in creating optimal training environments.

Notes

1. Past studies have referred to promotion-oriented feedback either as positive feedback, verbal rewards or praise. Similarly, the terms negative feedback, corrective feedback, failure feedback are used to refer to change-oriented feedback. In the present paper, the terms promotion-oriented feedback and change-oriented feedback are preferred because this terminology focuses on the goal of the feedback (i.e., promoting or changing a targeted behavior) instead of its consequences, thereby avoiding possible confusion. This terminology also serves to standardize the presentation of research findings when reviewing past literature.

2. A fifth type of behavioral regulation, namely, integrated regulation, is also proposed. It is theoretically situated between intrinsic motivation and identified regulation on the self-determination continuum. It represents regulations that have been integrated with all aspects of the person's self. These regulations are thus fully accepted and are in harmony with one's values and identity (Deci & Ryan, 2000). Integrated regulations are usually not measured because they sometimes fail to differentiate from identified regulations in factor analyses (Vallerand et al., 1992).

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