

A Constraints-Led Approach to Ballet Pedagogy:

Developing Dynamic Movement Solutions

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## Abstract

*Background:* A constraints-led approach to sport pedagogy focuses on each student's unique learning experience whereby organismic, environmental, and task constraints interact dynamically to allow the design of task manipulations for the development of skilled movement. The constraints-led approach as utilized in an instructional practice for building new co-ordinations, allows for a more dynamic approach to ballet technique instruction, in finding solutions for each dancer within his or her specific interactions of constraints.

*Purpose:* The purpose of this project is to recognize where traditional linear sport pedagogy within ballet coaching can be replaced by task manipulations within a constraints-led approach to make for a more dynamic, inclusive, individualized, and open approach to coaching ballet.

*Findings:* A coaching menu design identified general problems found in executing the skill of echappé, from which specifically designed task manipulations through constraints to the skill could be applied. Additionally, an articulation of possible approaches within three defined constraints provided insight to the relevance of constraints in the learning process.

*Discussion:* Implications for myself as a coach were made in the success of designing a coaching menu that encouraged a continued use of the constraints-led approach to ballet pedagogy. Implications for other coaches include a suggested trial of the constraints-led approach through the use of designing coaching menus within unique athlete constraints, both external and internal. Lastly, implications for further research lead to a proposed search for connection between coaching menus made for different styles and techniques of ballet.

*Keywords:* Task Manipulation; Ecological Dynamic Approach; self-organizing movement; Co-ordination; Constraint Adaptations; Linear Pedagogy

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**Introduction**

Constraints-led approach to sport pedagogy opens a new avenue of coaching techniques and strategies to match the individualized focus of each student as a unique learning experience, differing from the more traditional linear sport pedagogy. In these traditional theories, skill-specific learning takes place from a set linear mold of prescribed instruction. In the dynamical systems theory, any experience or occurrence can be explained at varying levels of analysis under the same underlying general principles, no matter the system's individual properties such as structure or composition (Davids et al., 2015). In a comparison of linear cognitive processing and ecological theories of skill, Padmanabahn (2018) explained that through the lens of cognitive processors, the athlete builds a mental model of how to perform a skill and through consistent instruction, is able to walk through the specific pathway of learning. In contrast, through the lens of ecological theories, the interaction between the individual, environment, and tasks performed builds a development of skilled movement through unique learning pathways (Padmanabahn, 2018).

Traditional linear approaches to sport pedagogy rely on an “inside-out” theory where cognitive processor theories begin with a mental model of a skill, translated through rigid instruction. (Padmanabhan, 2018). This form of instruction, however, does not focus on developing the ability to adapt skill for environmental variability. Research into ecological dynamics has relayed that the athlete's ability to use continuous perception of information in the regulation of goal-directed actions to adapt his or her movements to the interlinked facets of performance environmental factors (Davids et al., 2015). Within this ecological dynamics

approach, the constant fluidity of dynamics within the relationships between the individual, environment, and new tasks performed demands a constant reorganization and adaption of actions and perceptions of athletes as they work to find movement solutions for unique sets of interacting constraints (Davids et al., 2015). The development of strong foundational knowledge and unique learning through constraint manipulation and self-organizing movement develops athlete capability of adapting skills to fit situational performance constraints, building a more performance versatile athlete.

An ecological dynamic approach based on constraint interactions could be utilized as a more comprehensive examination of movement learning and skill development. The constraints-led approach is based in a description of humans as complex systems built with several subsequent factors including a complex number of interaction of degrees of freedom, co-adapting pattern-formations of movement system parts, an ability to alter and control actions through information of constraints, the ability for dynamic systems to show an inclination towards stability and instability, and the possibility for emergent non-linear behaviors to be shown in irregularities of motor learning progression (Davids, 2010). This approach utilizes environmental constraints to guide the growth of movement coordination and control (Driska, 2019).

In studying movement co-ordination through the constraints-led approach, Bernstein (1967) highlights movement co-ordination acquisition as a “mastering” of multiple degrees of freedom (Davids, 2010). Newell (1986) developed a model of constraints in which organismic, environmental, and task constraints interact in the development of skilled movement. “Coordination emerges not from prescriptions for action but as a consequence of the constraints imposed on action. That is, constraints eliminate certain configurations of response dynamics,

with the resulting pattern of coordination a reflection of self-organizing optimality of the biological system, rather than specifications from some prescriptive symbolic knowledge structure” (Newell, 1986). Newell describes how constraints on action restrict particular response dynamics, from which co-ordination patterns are seen as a result of the individual’s self-organization of available and co-functioning constraints between the organismic and environment depending on the task. In this way, the three types of constraints are integrated, forcing the individual to create a unique self-organized solution in the form of movement co-ordination. Kelso states that “self-organization may arise due to competition not among conventional forces but among different sources of information” where “information” refers to influences affecting behavior (Kelso, 1995). The self-organization of new information within perspective of the three constraints is a process by which a motor solution can be identified through the development of co-ordination skills.

Ballet as a sport requires the dancer to build new movement co-ordination skills in order to perform the rigorously strict technical precision required to accomplish the goal-oriented tasks of both individual and connected steps. Many movement co-ordinations of ballet contrast with typical physical co-ordinations of everyday movement. For example, the dancer must co-ordinate the activation of rotation muscles in the leg to hold turn out throughout the execution of each movement action. This type of coordination must become an intrinsic coordination, seemingly innate to the dancer as he or she can then add to the complexity of each new step. Maslovat et al. (2010) describes two forms of constraints in building new coordination skill directly applicable to the sport of ballet execution. The first is the intrinsic constraints in the development of stability for newly learned patterns. She states that “learning is not simply the addition of a new pattern to those already acquired but rather involves a reorganization of the entire pattern

inventory a learner possesses at any given time” (Maslovat et al., Davids et al., 2010). Each time a new pattern is introduced, it competes with an intrinsic constraint of stability between in or anti-phases of egocentric or allocentric definitions (muscle contraction symmetry or extrinsic space direction symmetry) (Maslovat et al., Davids et al., 2010). The second is extrinsic constraint. With extrinsic constraint, the idea that more practice will lead to better skill performance assumes all other factors to be equal, when in reality, they are unequal. Contextual interference is an effect resulting in better long-term learning effects shown to occur for learning new coordination movements where introducing random and related skill presentations within practice allows dancers to become adept to the unpredictability of skill adaptation in addition to creating more involved in the learning process (Maslovat et al., Davids et al., 2010). Maslovat et al. describes skill presentation, stating that it is “more effective to withhold prescriptive ‘how to’ information and provide a more abstract reference template with task-relevant feedback” (2010). Because each dancer has unique organismic constraints, when provided a movement problem, he or she is able to develop a unique solution within his or her specific interactions of internal and external, organismic, environmental, and task specific constraints.

Past instructional approaches, would have taught to one specific modeled dancer image, disregarding anyone who did not fit these requirements in like constraints as unfit for the sport. The constraints-led approach as utilized in an instructional practice for building new coordinations, allows for a more dynamic approach to ballet technique instruction, in finding solutions for each dancer within his or her specific interactions of constraints. The purpose of this project is to recognize where traditional linear sport pedagogy within ballet coaching can be replaced by task manipulations within a constraints-led approach to make for a more dynamic, inclusive, individualized, and open approach to coaching ballet.

## Coaching Menu

### Teaching Echappé Coordination to Novice Ballet Dancers

Echappé is a ballet jump meaning “to escape” in which the dancer begins in a closed position, jumps to land in an open position, and back to the closed position.

- This is a novice level step, with risk of injury to knee or ankle upon the landing if the dancer does not properly hold the turn out of the backs of the legs or land in plié.

#### Basic coordination required prior to step:

*First position* – standing with heels together, toes apart, turning out the legs from the rotation muscles of the upper hamstrings and inner thighs, holding posture with shoulders down and abdominals engaged; arms are en bas (shaped to low circle).

*Second position* – first position, but with the feet apart

#### Desired skill learning outcomes/Step Execution

Step 1: *Plié* – bend knees, holding turn-out with arches lifted and knees open directly over the toes)

Step 2: *Push off the ground* – jump to stretch legs below, bring arms up to 1<sup>st</sup> position (circle in front of the belly)

Step 4: *Land in second position plié* – arms open to the sides (2<sup>nd</sup>)

Step 5: *Reverse to jump back into first position* – arms move down from the side to return to en bas.

Instruction: start with whole skill, show demonstration of the full skill, ask students to identify step meaning relevance to movement (*escape* apart and back together), observe dancers for development of invariant features of echappé including the goals of proper plié, position, stretched legs in the air, high jump coordination of arms with jump.

#### For dancers with LOW JUMP

- Add drill, sitting legs in front, feet on the wall, wall jump, see who can push out the furthest
- Constrain by holding weights to jump
- Constrain by eliminating jump, plié – relevé (press to straight legs, rise to ball of foot), fast action
- Constrain by using the ballet barre to add height
- Drill allow them to use “monster arms” (free arms) to get themselves into the air

#### For dancers struggling to POINTE FEET

- Constrain by eliminate jump, plié press – jump only one foot
- Constrain by using the ballet barre to add height
- Constrain by removing shoes, to emphasize action of the foot on the floor
- Constrain by eliminating high jump, focusing on low jump, ankle pressing only

#### For dancers struggling to hold posture

- Constrain by having them perform the step with their back against the wall
- Add frog stretch drill to increase turn out flexibility
- Constrain by having dancer perform step with hands on shoulders, lifted elbows

#### For dancers struggling with ARM COORDINATION “through 1<sup>st</sup>”

- Constrain by eliminating the jump, arms start 2<sup>nd</sup>, plié arms down, straighten arms to 1<sup>st</sup> quick
- Utilize the same arm coordination with relevé
- Jump only in first position, bringing arms all the way up to high 5<sup>th</sup> (round above the head) in one count to teach quickness of arm pathway through first

#### For dancers struggling with control of plié

- Constrain by eliminating high jump, focusing on low jump, to soft plié
- Constrain by changing exercise to hold plié longer
- Constrain by making long continuous plié and short small jump

## Constraint Adaptations

### Context 1 – Dealing with Fear (Functional constraint)

To adapt to the functional constraint of dealing with fear, I would turn to drills. Often, coming back from a significant injury creates fear in high-risk steps, such as jumping. Dancers have been used to protecting the recovering body part and often struggle with fear of re-injury. To cover this, I would use three drills to help my dancer both build strength back in the rehabilitation process as well as conquer her fear. Sometimes the fear comes from a concern of lack of strength and thus risk of repeating the injury, especially if the injury required extensive time off of physical activity. To combat this, we would begin with the wall jumping drill. The dancer would begin by sitting facing the wall with her feet in parallel planted on the wall, knees bent, and work on pushing off the wall. This drill retrains the muscles in the legs and feet similarly to a jump without the full impact of the landing. By sitting up, the dancer is able to keep visual contact with her recovering body part, tracking the knee right over the toe to prevent injury. Next, when my dancer was confident in this drill, we would perform the same drill, this time laying down, back against the floor, and in a slight turn out position. The slight turn out will build back to a full turn out when she later stands up for the full jump. By laying down, she is closer to the correct physical alignment of her body when in the air. She will have lost visual contact with the injury, but will be able to feel secure with the lack of impact from any landings. The next step would be to add small jumps at the barre for her. This drill limits impact of the knees and ankles as the dancer is holding onto the barre for support, maintaining a small jump, focusing on tracking the turnout and breathing into the plié. In this drill, she would move up in skill difficulty, but regain the visual contact again by use of the mirror. This visual contact would be able to provide her the support she needed in visually seeing her progress in strength. This



drill also allows her the freedom to use the barre as much or as little as she felt appropriate for her journey back.

### **Context 2 – Athletes and coach from different cultures (sociocultural environmental constraint)**

As a coach, it is our job to guide our athletes in becoming people they are proud of, it is not our position to impose our own cultural values over theirs. Instead, in order to connect with our athletes, it is important that we learn as much about the culture we are working with as we can. Understanding cultural values in the way children are treated, gender norms, and the meaning of winning or losing is important not only to uphold respect for our athletes as young people, but also in understanding their unique experience of learning the sport. As coaches, we have been where each of our athletes are. In order to reach the level of coaching, you must first learn to play the sport. Coming from different cultures, our learning experience may differ drastically from that of our own athletes. Many of my students are learning ballet within a cultural context far different from my own. When working with a group of students within a culture different from your own, you must first open yourself to learn about their lives, their values, and use that understanding to create new experiences for them, utilizing their unique sociocultural constraints to help guide their training into unique and beautiful ballet dancers. I would use this sociocultural environmental constraint in two ways. First, I would learn about their culture, close my own gap in understanding their perspective. Second, I would design my task constraint manipulations based on the sociocultural environmental constraint, adapting the task to fit within their sociocultural environment constraint. The ultimate goal being to find a stable pattern of movement, we would have to work within the athlete's individual constraint to find a strategy or technique that connected with his or her unique cultural values.

**Context 3 – arm amputee (structural individual constraints)**

If I were coaching a dancer with a mid-humeral amputation of one arm in an inclusive setting, I would work to adapt this particular step for his or her success. Again, our job as coaches is to manipulate the task constraints within individual athlete constraints. When working with a dancer with an amputation, one concept to be aware of is how the dancer's participation and treatment in class will relate to her level of self-confidence as both a dancer and a person. Wickman discusses the concept of learning through sports (2015). She writes that "they also gain a range of deep implicit, social, cultural, and personal experiences that challenge their self-esteem and their understanding of themselves according to dominating gender norms" (Wickman, 2015). Wickman identifies an individual who stopped training in her sport due to inadequate support and her own overly demanding perspective of herself (2015). When working within this structural individual constraint, task constraints should be modified to match the physical capacity of the individual, while building strength necessary to find success in the task at hand. She also describes an individual who recognized that admitting he needed help, or needed a different solution to a motor task than able-bodied peers opened the door for him to explore those options (Wickman, 2015). Task constraints should be altered to match the need of the individual. In the instance of ballet instruction, a task constraint for teaching echappé through the use of the barre would require alterations. The barre is meant to be used with two hands, so as to evenly train the muscles on either side of the body. Being given the same task constraint would create an uneven development of muscles in addition to frustration as the task constraint would not fit under the structural individual constraint. Instead, the individual could raise the barre height, such that he or she could fold his or her arm in front, and utilize the forearm rather

than the hand on the barre. This would allow for a more event push off the floor, creating a more adaptable task constraint to strength his or her jump.

### **Discussion**

Even in a world driven by progressive change, it can become challenging to find an open mind regarding new approaches to instruction, and ballet has been a uniquely fitting place to identify traditional linear methods of coaching to be replaced with a constraints-led approach to coaching. Beginning this project with a purpose of recognizing where traditional linear sport pedagogy within ballet coaching can be replaced by task manipulations within a constraints-led approach to make for a more dynamic, inclusive, individualized, and open approach to coaching ballet, I designed a menu of coaching options and considered multiple different possible constraint adaptations.

Through literary research, I identified key differences between linear pedagogy and the constraints-led approach. I found that it is not always necessary to start with a predetermined cognitive understanding of the information to be translated uniformly to skill specific movement. Having grown up in the traditional linear methods of instruction for ballet, I was used to being told there is one correct technique and one correct physical and mental make-up of an individual for ballet. I struggled with this concept, being that I did not seem to have all the necessary attributes of a ballet dancer. I was fortunate to have had enough that I could continue to a pre-professional level, but in working with my students, I had hoped to find a way for each dancer to succeed to the best of their ability and ambition. A literary research into these key differences identified specific ways in which this could be accomplished. Research into ecological dynamics highlights the athlete's ability to use perception of contextual information in the regulation of goal-directed actions in order to adapt to the dynamic performance factors (Davids et al., 2015).

Incorporating Newell's (1986) constraints model, a constraints-led approach allows for a more comprehensive theory of learning, where interactions between the organismic, environmental, and task constraints interact uniquely and in constant motion to form new patterns of task specific movement problems. Presented with a newly constrained movement problem, the athlete must then work to create a unique self-organized solution in the form of movement co-ordination. Ballet inherently requires the constant re-organization of solutions for movement co-ordinations as new steps are learned and technique is refined. As Maslovat et al. states, each time a new pattern is introduced to be learned, it creates a re-structuring of the known co-ordinations to assimilate the new pattern (2010). By identifying where various constraints intersected, I determined individualized approaches to coaching ballet technique.

I identified invariant features of an essential novice ballet skill, echappé, by utilizing the concept of task manipulation to design a menu approach for common skill. When breaking down the step to recognize areas of typical student difficulty, I noticed features that should be sought after universally in meeting baseline requirements of the skill accomplishment. Additionally, the use of constraints within the menu approach added to the many ways a task can be manipulated to achieve a specific goal. I identified an additional connection through terminology to the movement problem. The step, echappé means to escape; the movement problem is the jumping transition of escaping apart and together with reflective coordination of the arms. A previous approach to coaching this skill would have entailed a cognitive description of jumping from first position to second position and back to first position. I would have paired the position of the legs with the position of the arms, creating unnecessary instability in movement patterns. Rather than providing time for dancers to discover their own motor solutions, the step would have been taught in a linear, lecture/demonstration format. Dancers would not be able to find their own

strengths and weaknesses within the step, and thereby would not have an adequate foundation to adapt the step for future use in different contexts.

Lastly, within the constraint adaptations, three different constraints were presented: a functional constraint, sociocultural environmental constraint, and a structural individual constraint. My task was to describe the best way to approach each constraint within this constraints-led approach to coaching ballet. As a coach, we have several varying constraints to adapt our teachings to. It is our job to see the athlete as a unique and complete individual with varying experiences and different constraint interactions. By isolating one specific constraint, it is easier to see how each constraint shaped the individual. In order to adapt to the functional constraint of dealing with fear, I chose to utilize drills. When coming back from an injury, fear to perform advanced steps, such as jumps, is strong, and the first priority is to build both the physical strength as well as the confidence of the dancer. A confident dancer can trust her body, and will approach each step with full investment, whereas an insecure dancer cannot trust her body, and becomes subject to increased risk for injury if the body is not held when entering a step. Adapting task manipulations within the functional constraint of the dancer, provides a safe and gradual re-entry to full sport participation. The second context was in regard to a sociocultural environmental constraint. In this context, the coach is given the opportunity to learn about athlete's culture and thereby their experience as a learner in that culture. It is important to remember that this constraint acts as a filter for how the individual perceives, approaches, and responds to your coaching as well as the game. By developing specific task manipulations and coaching strategies that aligned with your athlete's sociocultural environmental constraints, communication is opened and the opportunity to understand how your athlete's learning experience is processed and translated into goal-oriented movement. The last context was a

structural individual constraint. Upon a brief literary review, I learned about the importance of recognizing sport training as an opportunity to grow and guide young people. In the inclusive setting, it can be challenging to adequately support all of your athletes. Wickman (2015) explained that in addition to sports training, athletes with disabilities are given opportunity to develop social, cultural, and personal experiences that allow a challenge of their self-esteem. The evaluation of these three constraint adaptations provided a valuable opportunity to connect the constraints-led approach to ballet coaching.

### **Implications for Practitioners**

Ballet instructors can utilize these findings to directly improve their student's learning and skill achievement. The constraints-led approach can be applied to instructional practices in order to build new co-ordinations. This allows for a dynamic approach to ballet technique in which each dancer has the ability to find individual solutions to their unique constraints. Current practitioners can use their current syllabus or class direction plans as a guide in creating several coaching menus. By breaking down each step, practitioners gain a deeper understanding for each part, and are able to identify and develop various unique task manipulations to help strengthen different aspects of each step. These task manipulation exercises allow dancers the freedom of working within their own constraints while defining the individual details of each learned step. Additionally, ballet instructors can identify with or understand the dancer's life, and subsequently various constraints. This allows teachers the ability to reach children from their perspective, establishing more meaningful teacher-student relationships and fostering more enriched learning.

Practitioners using this constraints-led approach can build a similar coaching menu, adding different task manipulations to the many common problems identified within the

performance of a specific step. Teachers should discuss their own task manipulations and student solutions in addition to sharing their discovered common problems. This type of discussion would create an abundance of shared discoveries in both learning and teaching. Additionally, by sharing their different experiences with their classes' constraint adaptations, teachers can brainstorm ways to build such adaptations as well as hear how a peer may have approached a similar situation to your own in a completely different way. Overall, utilizing a constraints-led approach points to positive movement in the chase for a more inclusive and diverse, as well as intellectually adaptable learning environment.

### **Implications for Researchers**

This study gives way to new implications for researchers through a search into general common problems and different task manipulations that can be used to address them. There are three immediate questions that could be investigated. How do the individual constraints vary within a single level? At the instructional training ages, levels are based mostly on age in combination with training. For instance, I have 24 in my level three class ages 10-12. One crucial area of research to be done would include looking into if different constraints of similar movement problems could be grouped together within a larger group. A second area for potential research would be the effects of peer group study. The constraints-led approach is mostly independently grown, but would it be possible to incorporate a group aspect where students with similar problems work together to find solutions. Lastly, an area of research to be had includes a search into the differences in resulting coaching menus depending on the school of ballet followed. There are several schools of thought in regard to teaching ballet. Would these drastically different syllabi share a set of coaching menus or have their own set of different menus and adaptations? Overall, this experience could lead to revolutionary changes

in the way ballet is taught at the professional school level. As questions grow from individual to group collaboration, it could become more efficient and easier to incorporate constraints-led approaches in the regular syllabus, and as an evaluation of the different styles of classical ballet instruction would determine, is the core of ballet unified across all forms of study?



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