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Comparative Affective Outcomes Associated with Circus Arts Instruction in Quality Physical Education

ADAM WOOLLEY,[1] NATALIE HOUSER,[2] DEAN KRIELLAARS[1]

[1] *University of Manitoba, College of Rehabilitation Sciences*

[2] *University of Saskatchewan, College of Kinesiology*

Emerging evidence suggests that circus arts instruction (CAI) offers various physical, psychological and social benefits for young people. Physical education (PE) is a salient context for investigating CAI's impact due to its broad reach, as well as the alignment of CAI outcomes with features of quality physical education (QPE) as described by UNESCO. Limited information exists on the affective impact of CAI in PE relative to other PE. This cross-sectional study compares the self-descriptive features and emotions of students in CAI-QPE with those of students in a comparable high-quality PE context.

The odds of experiencing pride or enjoyment (OR=7.3, $p<0.05$) and the median intensity of pride and enjoyment (effect size=0.17 and 0.25, $p<0.05$) were greater in CAI-QPE. More students in CAI-QPE reported a positive overall emotional experience (effect size=0.20, $p<0.05$) and higher emotional intensity (effect size=0.23, $p<0.05$). The median intensity of shame and anger were lower in CAI-QPE, and boredom showed statistical significance (effect size=0.17, $p<0.05$).

Physical literacy self-description, movement valuation and self-esteem were also measured, showing differences that approached significance. *Post hoc* power analysis revealed appropriate power to detect these differences, making self-descriptive features an unlikely but possible explanation for the differing affective outcomes. An alternative explanation is that some pedagogical or content-related aspects of CAI played a role in improving affective outcomes. This explanation seems likely given evidence that many of the pedagogical

Contact: Adam Woolley <adam.woolley@me.com>

approaches in CAI (free play, peer-to-peer learning, mastery environments, risk permissive play), which allow students to develop a unique movement identity, have shown positive affective outcomes.

De nouvelles données suggèrent que l'enseignement des arts du cirque présente de nombreux avantages pour les jeunes, tant sur les plans physique et psychologique que sur le plan social. L'étude des impacts de l'enseignement des arts du cirque dans le cadre de l'éducation physique (EP) s'avère particulièrement pertinente en raison de sa grande portée, mais aussi parce que les résultats qui en découlent font écho aux caractéristiques d'une éducation physique de qualité (EPQ) détaillées par l'UNESCO. Les informations sur les répercussions affectives de l'enseignement des arts du cirque dans l'EP par rapport à d'autres formes d'EP sont rares. Cette étude transversale met en parallèle les caractéristiques et les émotions décrites par les élèves eux·elles-mêmes dans le cadre d'une EPQ intégrant l'enseignement des arts du cirque avec celles d'élèves suivant une EPQ d'un genre comparable.

La probabilité de ressentir de la fierté ou du plaisir (OR = 7,3; $p < 0,05$) et l'intensité médiane de la fierté et du plaisir (ampleur de l'effet = 0,17 et 0,25; $p < 0,05$) se sont révélées supérieures pour une EPQ intégrant l'enseignement des arts du cirque. Un plus grand nombre d'élèves suivant une EPQ avec un enseignement des arts du cirque ont confié avoir vécu une expérience émotionnelle générale positive (ampleur de l'effet = 0,20; $p < 0,05$) ainsi qu'une plus forte intensité émotionnelle (ampleur de l'effet = 0,23; $p < 0,05$). L'intensité médiane en matière de honte et de colère est apparue plus faible dans l'EPQ avec un enseignement des arts du cirque. L'ennui a démontré une réelle signification statistique (ampleur de l'effet = 0,17; $p < 0,05$).

L'autodescription de la littératie physique, l'appréciation des mouvements et la confiance en soi ont également fait l'objet de mesures, mettant en lumière des différences proches d'une signification. Une analyse de puissance *post hoc* a révélé un niveau de puissance approprié pour la détection de ces différences, faisant des caractéristiques autodescriptives une explication peu probable, mais pas impossible, des différentes répercussions affectives. On pourrait aussi penser que certains aspects pédagogiques ou liés au contenu de l'enseignement des arts du cirque ont joué un rôle dans l'amélioration des résultats sur le plan affectif. Cette interprétation semble plausible étant donné que beaucoup d'approches pédagogiques de l'enseignement des arts du cirque (jeu libre, apprentissage par les pairs, maîtrise des environnements, jeu permissif à risque), qui permettent aux élèves de développer une identité propre par rapport au mouvement, ont démontré des répercussions affectives positives.

Keywords: physical literacy, emotions, teacher, pedagogy, student, littératie physique, émotions, corps enseignant, pédagogie, élève

Introduction

A growing body of evidence suggests that circus arts instruction (CAI) is an effective means of developing an array of social, psychological and physical competencies in young people. Implementations of CAI in physical education classes are of particular interest due to the expansive reach of physical education in public schools. Further, the outcomes associated with CAI align with various attributes of quality physical education (QPE) outlined by the United Nations Educational, Scientific and Cultural Organization (UNESCO),[1,2] making CAI a potential exemplar of QPE practices. The alignment between QPE and CAI positions CAI as a pedagogical and curricular approach that can potentially enhance the physical, psychological and affective outcomes of PE for a wide swath of the population that may not have access to CAI.

In a quasi-experimental design, Kriellaars et al.[3] found that CAI-PE classes led to improvements in motor competence and confidence among fourth and fifth-grade students relative to standard PE classes. These improvements were more dramatic in girls than in boys, effectively reducing the sex/gender-based disparity in motor competence that is often apparent by this age.[3,4] These enhancements in motor competence and confidence have been shown to be a strong predictor of resilience—a psychological feature related to a person's ability to cope with stressors and obstacles in life.[5,6] This resilience might stem from exposure to autonomous positive challenges creating an appropriate entry point for each student's ability level and allowing individualized and autonomous skill modification. These individualized adaptations are plentiful in CAI,[7] where multiple skill disciplines (juggling, aerial, balance), skill progressions (each individual self-selects the difficulty of their attempt) and entry points (for example, "juggling" can refer to a wide variety of object manipulation skills) are readily available.

Resilience is not the only psychological attribute that CAI and physical literacy have been linked with; in a study examining recreational CAI with a focus on psychological development, Agans et al.[8] found that in their group of 111 students (ages ten to 21 years) with a wide range of circus experience, psychological need satisfaction in circus positively predicted outcomes such as resilience, concentration and positive affect, and negatively predicted negative affect.

A qualitative longitudinal study of circus arts in Brazilian public schools also found high engagement from students of all genders and described in detail the pedagogical approaches used in CAI-PE in Brazil. These practices included free play, circuit activities, socialization, problem-solving and creativity-permissive environments,[9] all of which have been associated with positive psychometric and physical outcomes in and out of school.[10-14] These approaches may be

ubiquitous in CAI,[15] and the creative, individualized and diverse nature of activities in CAI may predispose teachers toward these approaches.[16]

CAI also has social competency benefits related to trust-building, belonging and healthy risk perspective[17-19] when utilized in marginalized communities where these factors play a critical role in well-being.[17,20] The incorporation of creative, non-competitive activities in CAI[21] is an important feature that separates it from traditional sport-centric PE delivery models[22,23] and places it firmly within a family of arts activities that have been shown to have their own unique and positive influences on well-being.[24-27]

The processes through which CAI accomplishes these outcomes are unknown but likely linked to the development of physical literacy. Definitions of physical literacy and its associated processes[28,29] identify affect as an important component. The capacity of CAI to engender positive affect[8] and activate the competence-confidence cycle in the physical literacy engine[1] may be due in part to an increased likelihood of positive emotional experiences related to the achievement of skills,[30] as well as the way CAI enables students to pursue their own movement interests at their own pace.[31] For example, when students have multiple stations within a circus discipline like juggling, they can choose an entry point that matches their interests (ball, rings, flower sticks, etc.) and ability level, as opposed to cases in which all students start at the same entry level.

While CAI occurs in many different contexts, it is particularly salient in physical education because the outcomes and strategies detailed above align with the QPE features outlined by UNESCO[2]. A comparative analysis of student emotions in CAI-QPE and QPE using specific emotions rather than positive and negative affect alone[32,33] may yield insights into the student experience of CAI-QPE in comparison to QPE. This study seeks to provide data on the emotional experiences associated with CAI-QPE using QPE as a comparison group. These findings may allow for a better understanding of the mechanisms underlying the benefits of CAI, as well as inform the practice and implementation of QPE.

Methods

This comparative analysis was embedded within a cross-sectional study of fourth and fifth-grade students (n = 145, fourth grade = 72, fifth grade = 73, average age = ten years) from a single school division in Winnipeg, Canada. This study met all the criteria for reporting cross-sectional studies based on the STROBE checklist.[34]

School and PE context

In this school division (26 schools, 9,000 students), all PE teachers receive an average of four full days of physical literacy-related professional development each school year and also have the support of a full-time physical and health education coordinator; these factors may contribute to this school division being described as implementing key characteristics of QPE.[1] Comparing CAI-QPE to QPE, rather than standard PE delivered by non-specialists, is necessary to determine whether CAI has benefits that differ from the benefits of QPE.

All PE classes were approximately 38 minutes long and consisted of mixed fourth and fifth-grade students, with a nominal class size of 22. The school division has fifteen elementary schools, all of which share similar socioeconomic factor index profiles,[35] and ten of those schools deploy CAI-QPE. The proportion of schools recruited in this study (three CAI-QPE and two QPE) matched the proportion of CAI-QPE in the school division. The QPE schools did not have any form of circus arts instruction, so the two arms of the study were separate.

All CAI-QPE teachers had received an instructor certification from the École nationale de cirque in Montreal, had at least three years of experience teaching circus arts as part of their PE curriculum, and had special equipment relating to each circus arts discipline (aerial equipment, tumbling mats, balance equipment and novel juggling objects). The extent of CAI teacher training ($5,000 per teacher) and the investment in special equipment ($15,000 per school) sets this CAI-QPE apart from the simple delivery of a circus arts unit or a guest circus arts instructor. In the studied schools, CAI-QPE was a regular occurrence rather than a novelty, which increases the ecological validity of the study by reducing any bias toward the enjoyment of new or novel activities. The regularity of exposure to CAI increased the normalcy of circus arts activities, and the pedagogical approach that CAI engenders (circuit stations, peer-to-peer teaching, skill development, encouraging creativity and individual variation) may also have influenced the way CAI-QPE teachers approach other more sports-centric units.

Observational analysis was conducted prior to each survey, revealing pedagogical practices in the CAI-QPE classes consistent with previous research[1,31] and physical literacy-enriched pedagogical approaches in both CAI-QPE and QPE classes aligning with QPE principles.[1]

Ethics and participant consent

Parental consent and student assent were obtained before the study was conducted. All instruments and procedures were approved by the Human Research Ethics Board at the University of Manitoba (HS25257). Approval was also granted by the division superintendent, school principals and PE teachers.

Instruments

The survey instruments were deployed immediately after a QPE or CAI-QPE class in students' homeroom classes in October and November 2022, after a minimum of five weeks of classes (with a minimum exposure of fifteen classes). Students in the CAI-QPE schools had an exposure of two to five CAI classes prior to the assessments.

To minimize response bias, PE teachers were not present. The survey consisted of three instruments separated into two parts. The first part consisted of the Discrete Emotions in Physical Education Scale (DEPES), and the second consisted of two self-descriptive tools (PLAYself and PSDQ-S).

DEPES measures six emotions on a five-point Likert scale and has been assessed for reliability and validity.[36] Two exploratory items were added—a five-point intensity scale ("The intensity of my emotions in this PE class was: one [very weak], five [very strong]") and an open-ended question ("The main emotions I felt in this PE class were: [. . .]"). Internal consistency checks using McDonald's omega, item-rest and items-drop analyses were performed, resulting in the omission of the relief subscale due to poor item-rest correlations, improved McDonald's omega in item-drop analysis, and substantial confusion expressed by students relating to the meaning of "relief." The remaining five emotions (shame, anger, boredom, pride and enjoyment) showed a McDonald's omega = 0.91. Two additional variables were derived from DEPES: 1) overall emotional valence (OEV),[37] which represents the sum of positive emotions minus negative emotions, and 2) the prevalence of each emotion determined by the proportion of students who marked "agree" or "strongly agree" for any emotion. The DEPES survey items explicitly requested that the students provide their emotional responses to the class they had just experienced.

The physical literacy self-description (PLSD) and movement valuation subscales of the Physical Literacy Assessment for Youth: Self (PLAYself) were also used. PLAYself has demonstrated very good psychometric properties[38] and convergent validity with motor competency tests.[39,40] The PLSD subscale employs eleven items, and the movement valuation employs three items with both scales utilizing a four-point Likert scale. Internal consistency checks were performed and showed a McDonald's omega = 0.86, which is consistent with prior studies.[38]

The final instrument was the global self-esteem subscale of the Physical Self-Description Questionnaire-Short (PSDQ-S), which has five items on a six-point Likert scale.[41] Internal consistency was performed, showing a McDonald's omega = 0.91.

Statistical analysis

Based on the ordinal nature of the scales, we deployed non-parametric statistical methods: descriptive statistics including medians and interquartile ranges, Mann-Whitney U-tests for comparison of medians and Chi-square analyses for comparing the odds of experiencing each emotion. All analyses were conducted using JAMOVI v.2.3.[42] An alpha level of $p <= 0.05$ was adopted.

Results

Table 1 shows a comparison of the prevalence and intensity of emotional and self-descriptive variables between CAI-QPE (n = 101) and QPE (n = 44) groups.

Table 1. Comparison of emotional and self-descriptive variables between CAI-QPE and QPE (prevalence and median with IQR). One-tailed Mann-Whitney rank biserial U-Tests, hypothesis testing CAI-QPE > QPE for pride, enjoyment, OEV, intensity*OEV, PLSD, movement valuation and self-esteem; hypothesis CAI-QPE < QPE for shame, anger and boredom. Effect sizes of non-significant differences were omitted.

	Prevalence		**Median (IQR)**		
	CAI-QPE	**QPE**	**CAI-QPE**	**QPE**	**Effect size**
PRIDE	94%	84%	12.4 (4)	11.5 (4.25)	0.25
ENJOYMENT	96%	81%	13.0 (4)	11.5 (6.5)	0.17
SHAME	10%	18%	1.0 (3)	1.0 (3)	–
ANGER	7%	11%	0.0 (3)	1.0 (4)	–
BOREDOM	13%	25%	2.0 (4)	3.0 (3.25)	0.17
OEV > 0	100%	91%	25.0 (15)	20 (15.75)	0.20
INTENSITY WEIGHTED OEV	–	–	104.0 (84)	80.0 (108.5)	0.23
PLSD	–	–	37.0 (8)	34.5 (10.25)	–
Movement valuation	–	–	11.0 (3)	10.5 (3)	–
Self-esteem	–	–	25 (6)	25 (8)	–

Note: Effect size is the difference between median scores and was determined by rank-biserial correlation coefficient. Between-group significance is $p<0.05$. Effect sizes less than 0.3 are assessed as small. OEV: overall emotional valence. PLSD: physical literacy self-description.

Most emotional variables showed statistically significant differences favouring CAI-QPE, with small effect sizes ranging from 0.17 to 0.25. *Post hoc* power analysis revealed that the study was appropriately powered to detect differences between groups with effect sizes of 0.30 or greater.

While the differences in prevalence, intensity and self-descriptive features between groups universally favoured the CAI-QPE group, not all differences were statistically significant. Although no significant differences were seen in PLSD, movement valuation or self-esteem between groups, Figure 1 shows a unique bimodal distribution in the PLSD of the QPE group.

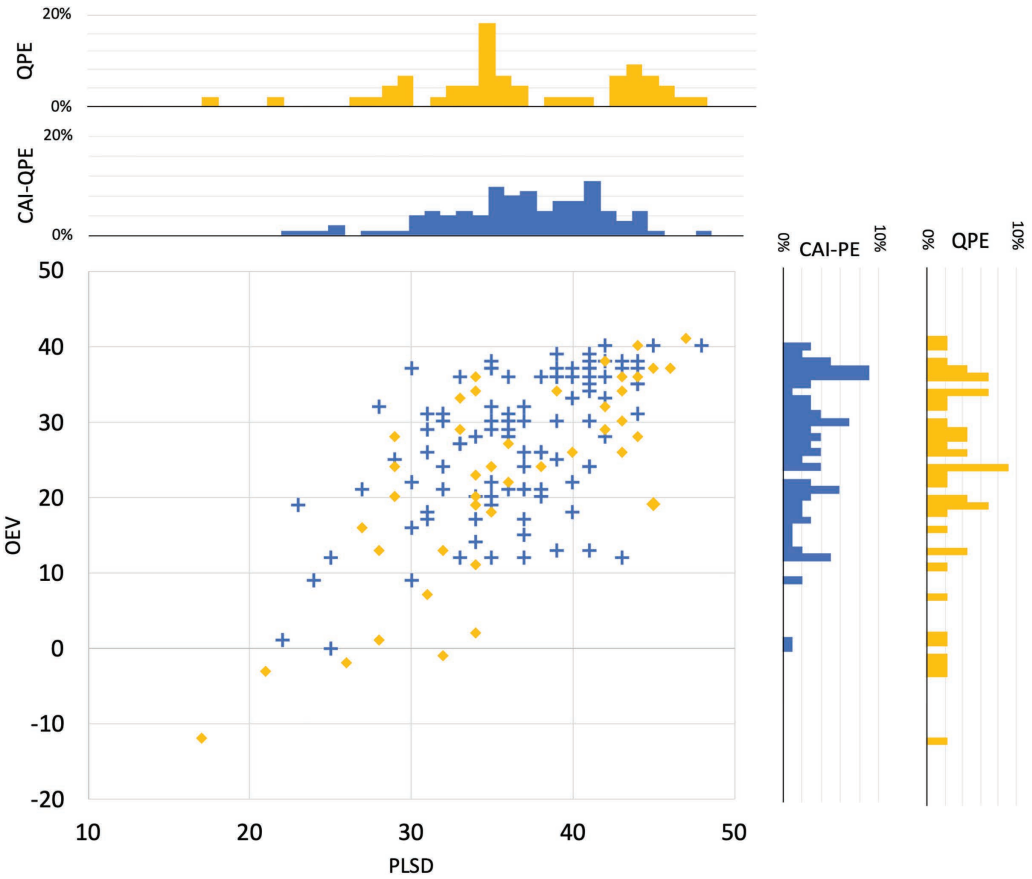

Figure 1. Scatterplot of physical literacy self-description (PLSD) and overall emotional valance (OEV) with students categorized by CAI-QPE (blue) and QPE (yellow) with embedded histogram distributions (percentage of students). OEV scores below 0 represent negative overall emotional valance.

Chi-square analysis revealed that there were significantly greater odds of experiencing pride (OR = 3.0, $p<0.05$), enjoyment (OR = 5.3, $p<0.05$) and aggregate positive emotions (OR = 7.3, $p<0.05$) for the CAI-QPE group. The p-values for the odds of experiencing shame ($p = 0.2$), anger ($p = 0.3$), boredom ($p = 0.07$) or aggregate negative emotions ($p = 0.06$) ranged widely, with two variables (boredom and aggregate negative emotions) approaching $p<0.05$.

Discussion

The primary purpose of this study was to compare the affective and self-descriptive outcomes of CAI-QPE and QPE. Prior to interpreting this comparison, it is important to emphasize that all classes in the QPE comparison group were delivered by experienced specialist teachers with extensive professional development in physical literacy. In interviews and observations conducted as part of a concurrent study,[1] the pedagogical approaches of all participating teachers were aligned with the quality QPE principles outlined by UNESCO. It is also important to consider that the comparison group represents a high standard of PE delivery and may not have been representative of student experiences in PE more broadly. Rather, this sample compared high-quality PE delivered by experienced teachers familiar with physical literacy principles to CAI delivered by similarly experienced teachers. While no significant differences were found in the PLSD, movement valuation or self-esteem between the two groups, the median (IQR) PLSD of the aggregate fourth/fifth-grade sample (37[7]) was higher compared to a group of children (36.5[7]) approximately one grade level higher; this was measured using PLAYself after the onset of the COVID-19 pandemic,[43] providing further support for the notion that the studied context was an example of QPE and that QPE may benefit students self-descriptive features.[44]

The absence of a difference in these self-description measures does not necessarily suggest that CAI-QPE has no effect on these factors, but rather that both groups in this sample had activated the competence-confidence loop of the physical literacy engine,[28] thereby contributing to the development of PLSD, self-esteem and movement valuation of students. While the median PLSD scores were similar between groups, the unique bimodal distribution of PLSD in the QPE group (Figure 1) may indicate the early stages of a reduction in movement valuation and participation that is well-documented among older students.[45-49] As this distribution is not present in the CAI-QPE group, it may be that CAI-QPE delays or diminishes this effect, but a longitudinal study that tracks PLSD through this critical transition would be necessary to confirm this conjecture.

While the self-descriptive measures were similar between the two groups, the CAI-QPE group showed greater prevalence and greater intensity of positive emotions, which may have positive downstream ramifications for motivation and self-esteem related to movement for those students. Inclusivity is an essential aspect of QPE,[2] and it is important to recognize how a movement experience can be inclusive or exclusive; "affective inclusivity," or students sharing similar emotional experiences during class, may be a meaningful form of inclusivity. To be more specific, when the prevalence of positive emotions increases, more students are enjoying PE, which may be an indicator of greater affective inclusivity. The greater prevalence of positive emotions and the unimodal distribution of PLSD in the CAI-QPE group aligns with previous research[31,50] on the outcomes of CAI, suggesting that these effects may be related to the impact of CAI on students. While this study did not detect significant differences between groups in any of the negative emotions, the measures of aggregate negative emotions (OR = 0.49, p = 0.06) and boredom (OR = 0.44, p = 0.07) were likely subject to Type II errors at this sample size, as suggested by *post hoc* power analysis.

Interestingly, we also found a significant difference in emotional intensity between the two groups; students in CAI-QPE described their emotions as more intense, implying a greater valuation of their CAI-QPE experience than their peers in QPE.[37,51] While studies of emotional intensity (rather than emotional type) are scarce, it has been demonstrated that valuation of an activity aligns with emotional intensity and vice-versa,[32,52,53] and that intense emotional activation can be related to memory formation.[54] It is possible that promoting high movement valuation via positive emotional experiences in this age group may insulate students from the drop-off in physical activity levels seen during the transition from elementary to middle school.[47]

Although this study did not examine sources of the differences in emotional measures, the similarity in PLSD and self-esteem between the two groups diminishes the likelihood of pre-existing self-description as an explanation. For example, if the difference in PLSD between the groups were statistically significant, it would be plausible that students' perceptions of their competency influenced their experiences of enjoyment or pride in PE class. As the differences in PLSD or self-esteem were minimal between the two groups, it can be surmised that the contribution of self-descriptive features to differences in positive emotions between groups was also minimal. Instead, characteristics of CAI-QPE, which have been shown to have positive effects in other studies (e.g., autonomy, mastery environments and skill progression), may have played a role in the differences in emotional prevalence and intensity between the groups.[30,55,56]

Regardless of the mechanisms, the prevalence of positive emotions was greater in CAI-QPE compared to QPE. These results indicate that CAI-QPE may

have the potential to promote positive affect, increase the intensity of those emotions and possibly affect the valuation of movement. This study paves the way for using CAI as a QPE instructional approach that would have global utility and applicability in school contexts by building on accumulating evidence revealed in a recent scoping review on the health benefits of circus.[27] While the experience of positive emotions in PE is a laudable goal in itself,[33] it may also create habitual associations with movement contexts that support future participation.[57,58] Given that CAI-QPE includes a wide variety of activities, these positive associations may feed into a variety of activities and delay or prevent domain specificity in motivation related to movement. The creative, non-competitive aspect of circus arts may also contribute to a climate of inclusivity in PE,[49,59,60] creating the potential for students to develop movement identities suited to their interests and abilities rather than having to choose between discrete sports activities.[22]

These findings lay the foundation for future research on how circus arts can be used to enhance PE teacher delivery and understanding of physical literacy principles, the effects of different pedagogical approaches within CAI delivery and the development of student movement identities.

Conclusion

In this study, CAI-QPE demonstrated a greater prevalence and higher intensity of positive emotions (pride and enjoyment) than QPE, even when self-descriptive features (PLSD, movement valuation and self-esteem) between the two groups were very similar. This increase in positive affect and overall intensity of emotions may indicate higher valuations of PE and greater "affective inclusivity," warranting further study of CAI-QPE approaches and their alignments with physical literacy-enriched pedagogy and QPE more generally.

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