We first want to think you for your recognition of the novelty of our work, and especially your suggestions in improving the presentations of this work, which helped us tremendously in this revision. Your comments and suggestions are replied as follow:

Major Comments

1. Thank you for your suggestion, we have carefully reviewed the manuscript, and made our best efforts to eliminate the grammatic mistakes and unclear formulations
2. We have indicated in the manuscript that all experiment results were measured with the exoskeleton only worn on the right leg. Unfortunately, conducting experiment with the exoskeleton on both sides is unrealistic for us right now, considering the time it may take. To make the experiment results more comprehensive, we have included the data for the left leg, and a discussion on how the asymmetry affected the evaluation of the exoskeleton.
3. The kinematic and kinetic data for the hip joint is now included in the manuscript.
4. The training time (20 minutes) for the EXO\_ON and EXO\_OFF conditions were referenced from [8]. However, we recognize a longer training session may be more appropriate, especially considering the exoskeleton in this work functions in a more complex way than that in [8]. The training session was conducted one day before the data collection session. On the same day before data collection, the participants were also asked to walk under the EXO\_ON and EXO\_OFF conditions each for one or two minutes for warming up. This information is now included in the “Experimental protocols” subsection.
5. Thank you for raising this question. The reason for not connecting ropes in the EXO\_OFF condition is even if the clutches are open, the thigh and foot are still connected by the two ropes and the torsion spring. Without controlling the clutches to couple and decouple the torque spring from the knee joint and ankle joint, it will impose large hindering moments at both joints during walking. The functionality of the clutches is mainly to hold the torsion spring without passing moments to knee or ankle during some periods in a gait cycle. The kinematic constraints evaluated by the EXO\_OFF condition are those imposed by the foot, shank braces and the artificial ankle joint connecting them. We have made this explicit in the manuscript.

Minor Comments

1. The title is now fitted into two lines, and “knee joint and ankle joint” is changed to “knee and ankle joints” to make the title more compact.
2. We have changed the phrasing to make this clearer. Namely, we want to express the passive and quasi-passive exoskeletons are designed to recycle the dissipated energy during decelerating lower limb segments, and supple this recycled energy when positive power is needed. By the way, there is a prosthetic foot that is relevant to ground reactions[[1]](#footnote-1). This prosthetic foot tries to recycle the energy dissipated in the collision between the foot and ground, and supply this energy during push off.
3. After reviewing the two papers again, we think it is still meaningful to compare them, but in a different way as appeared in our first submission as you kindly pointed out. The idea is as follows: By comparing Figure. 2a in [8] with Fig. 3c and Fig. 3d in [16], it is clear the optimized assistive torque at ankle is larger than that supplied by the passive exoskeleton, and this indeed resulted in higher metabolic cost reduction. We think it is legit to infer from this comparison that recycling energy alone from the passive work at ankle during dorsiflexion in stance is not enough to supply the best amount of assistive torque, because in [8] larger spring stiffness did not increase the assistive torque. Therefore, it may be beneficial to introduce another energy source, instead of ankle dorsiflexion only, to assist push off. We have modified the text carefully to accurately express this idea.
4. Thank you for pointing this out, we have made the change.
5. We are sorry for the confusing phrasing in the first submission. The idea we want to convey is: the Achilles tendon serves as a spring to store and release energy during mid- and late-stance phases respectively, so it seems there need not be metabolic energy expenditure at ankle during this process. However, the plantar-flexors need to provide a force to make the proximal end of Achilles tendon fixed in order to store energy. Thus, the plantar-flexors contract isometrically and there is metabolic expenditure in providing this force. Then, it reaches the conclusion that it is beneficial to replace Achilles tendon with a physical spring and anchor to recycle and release energy, so that the plantar-flexors are freed from providing forces. We have rewritten the paragraph to make it clearer.
6. Don’t understand the question
7. Thank you for noticing this typo, we have corrected it.
8. What we mean by side-effects are the added weight of the exoskeleton, the kinematics constraints imposed by the structures, and the potential resistive forces or torques exerted by the springs or other elements of the exoskeleton. We have clarified this in the text.
9. Sorry for our confusing English, there is no point to use the phrase “track the joint angle”, therefore we have removed it from the text.
10. Thank you for this suggestion. After considering a suggestion from another referee, we think step frequency, instead of walking speed, is a better justification of the time delays listed in Table 2, because these delays are directly related to the gait cycle period. Therefore, we added the step frequency (55 strides per minute) under the column title “Plantar pressure criteria” considering it only applies to this column of the table.
11. We recognize there were a lot of ambiguities in the equations in our first submission. We have replaced some of the less meaningful ones with those directly related to the parameter design process, i.e. the calculations of the negative power and work of the exoskeleton performed to the knee and ankle joints. Now we believe the notations used in these equations are well defined either in Fig. 7, 8 or in the text.

In terms of L\_knee and L\_kneerope, they are in fact two different quantities. L\_kneerope represents the length of rope between the ratchet and the anchor on the thigh plus those twined on the ratchets, whereas L\_knee represents the physical distance between these two points. They are different because during loading response in initial stance phase, knee flexion makes the rope slack, so the rope length outside the ratchet is longer than the physical distance. We have defined L\_kneerope and L\_anklerope in the text, and left L\_knee and L\_ankle as they were in the figures in this submission.

1. This was done by custom codes, and we have added the citation [add citation] where the algorithm was referenced to the manuscript.
2. Thank you for pointing this out. We have changed it to “This result demonstrates the energy is properly recycled and released by the torque spring”, as well as the conclusion drawn from the same result in the “Conclusions and future section”.
3. We have replaced the term “utilization coefficient of energy” by “the ratio of the energy released at push off to that recycled from the knee and ankle joints”.

1. Collins, Steven H., and Arthur D. Kuo. "Recycling energy to restore impaired ankle function during human walking." *PLoS one* 5.2 (2010): e9307. [↑](#footnote-ref-1)