

# Logical fallacies in the running shoe debate: let the evidence guide prescription

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For the past 40 years, running shoes have been prescribed on the basis of matching shoe features to foot morphology to prevent running-related injuries (RRI). Yet, traditional shoe prescription has not prevented RRIs—consider five quality randomised controlled trials (RCT) and observational cohort studies.<sup>1–5</sup> In contrast, a recent investigation<sup>6</sup> found that motion control shoes protected against injury in experienced runners who had pronated feet. There are likely important methodological reasons for the discrepancies between these studies, such as differing definitions of RRI and various experience levels among runners. Nonetheless, there remains a lack of conclusive evidence to support traditional shoe prescription to prevent RRIs.<sup>7</sup>

Alternative shoe prescription paradigms have emerged. While minimalist shoes have historically received the most attention from researchers, clinicians and runners, the more recent paradigms of maximalism, zero-drop shoes and choosing a shoe based on comfort appear to be gaining in popularity (see figure 1 for examples).

## AVOIDING THE TRAP OF LOGICAL FALLACIES IN SHOE DISCUSSIONS

In light of the lack of evidence supporting traditional shoe prescription, we must be careful not to view alternative shoe paradigms as suddenly more effective. This so-called ‘argument from ignorance’<sup>8</sup> logical fallacy would lead one to incorrectly conclude that a minimalist, maximalist, zero-drop or comfort approach is superior for injury prevention compared with traditional shoe prescription. To be clear, rigorous RCTs are lacking to support alternative shoe paradigms. The

second logical fallacy commonly encountered is that traditional running shoes are inherently injurious because they are not natural, that is, an ‘appeal to nature fallacy.’<sup>9</sup> For example, arguing that a greater degree of minimalism promotes natural foot motion<sup>10</sup> may have substance, yet there is no evidence that a more natural foot motion is indeed effective in the prevention of RRI.

## WHY CHANGE SHOES?

For clinicians, coaches and runners, there are two reasons to switch. First, enhanced performance; a lighter shoe improves running economy.<sup>11</sup> Second, a change in running biomechanics. Minimalist shoes, for instance, are suggested to increase running cadence, alter strike patterns and

reduce vertical loading rates.<sup>12,13</sup> However, stride parameters and footstrike patterns remain unchanged after a 6-month transition to minimalist footwear,<sup>14</sup> and there are conflicting findings on the effect of minimalist shoes on loading rates.<sup>13</sup> Data on injury rates in RCTs examining transitioning from a standard to a minimalist shoe are also mixed at best.<sup>13</sup> Even with a prolonged transition (ie, 26 weeks) in a moderate-quality RCT, minimalist shoes were no more protective against injury than standard shoes.<sup>15</sup> Two further moderate-quality RCTs found no change in running mechanics<sup>16</sup> or difference in injury rates<sup>17</sup> across runners who were transitioned to either zero-drop, mid-drop or high-drop shoes. We suggest a similar null effect for RRI incidence for maximalist shoes or shoe prescription based on comfort, due to a lack of appropriately powered RCTs on these paradigms.

## EDUCATING RUNNERS

Many runners believe that wearing the wrong shoe type for their foot is a leading cause of RRI.<sup>18</sup> Therefore, we, as informed clinicians, must counsel runners that



**Figure 1** Examples of various shoe paradigms. Clockwise from top left: traditional (Brooks Epinephrine 18), minimalist (New Balance Minimus Trail 10), zero-drop (Altra Torin 2.5) and maximalist (Hoka Bondi 6).

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evidence is lacking for shoe prescription, regardless of paradigm, for the prevention of RRI. Based on the role various shoe paradigms may play in the prevention of RRIs, runners should be instructed to choose a certain type of running shoe over another shoe no more so than a blue shoe over a red shoe. Moreover, education on appropriate training practices should be the cornerstone of our outreach and runner education efforts. For instance, a tailored, online education programme delivered every 2 weeks reduced RRIs by 13% compared with a single session of general education.<sup>19</sup>

## GAIT RETRAINING AS AN ALTERNATIVE TO FOOTWEAR PRESCRIPTION

If clinicians aim to change running biomechanics and lower risk of RRI, then gait retraining may be a better choice. A recent large, moderate-quality RCT (n=320) reported a 62% reduction in RRI as well as lower loading rates at 1 year follow-up after a 2-week gait retraining intervention aimed at reducing vertical loading rate in runners with high baseline loading rates.<sup>20</sup> This is in contrast to the previously noted study that reported no change in stride parameters and footstrike pattern after switching to minimalist footwear, even after 6 months of use.<sup>14</sup>

## WHERE TO NEXT?

Clearly, high-quality RCTs are needed to determine the best advice for runners with respect to footwear. Using the RCT of Fuller *et al*<sup>15</sup> and the observational cohort of Nielsen *et al*<sup>4</sup> as models, investigators should carefully control the transition periods to a new shoe type and exposure to running should be assessed by global positioning system technologies. Future trials should also use the consensus definition of RRI to enable comparison across studies.<sup>21</sup> While we anticipate that evidence to support specific running shoe prescription paradigms might soon

emerge, we caution against overstating the benefits or harms of any existing or future shoe paradigms to runners.

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